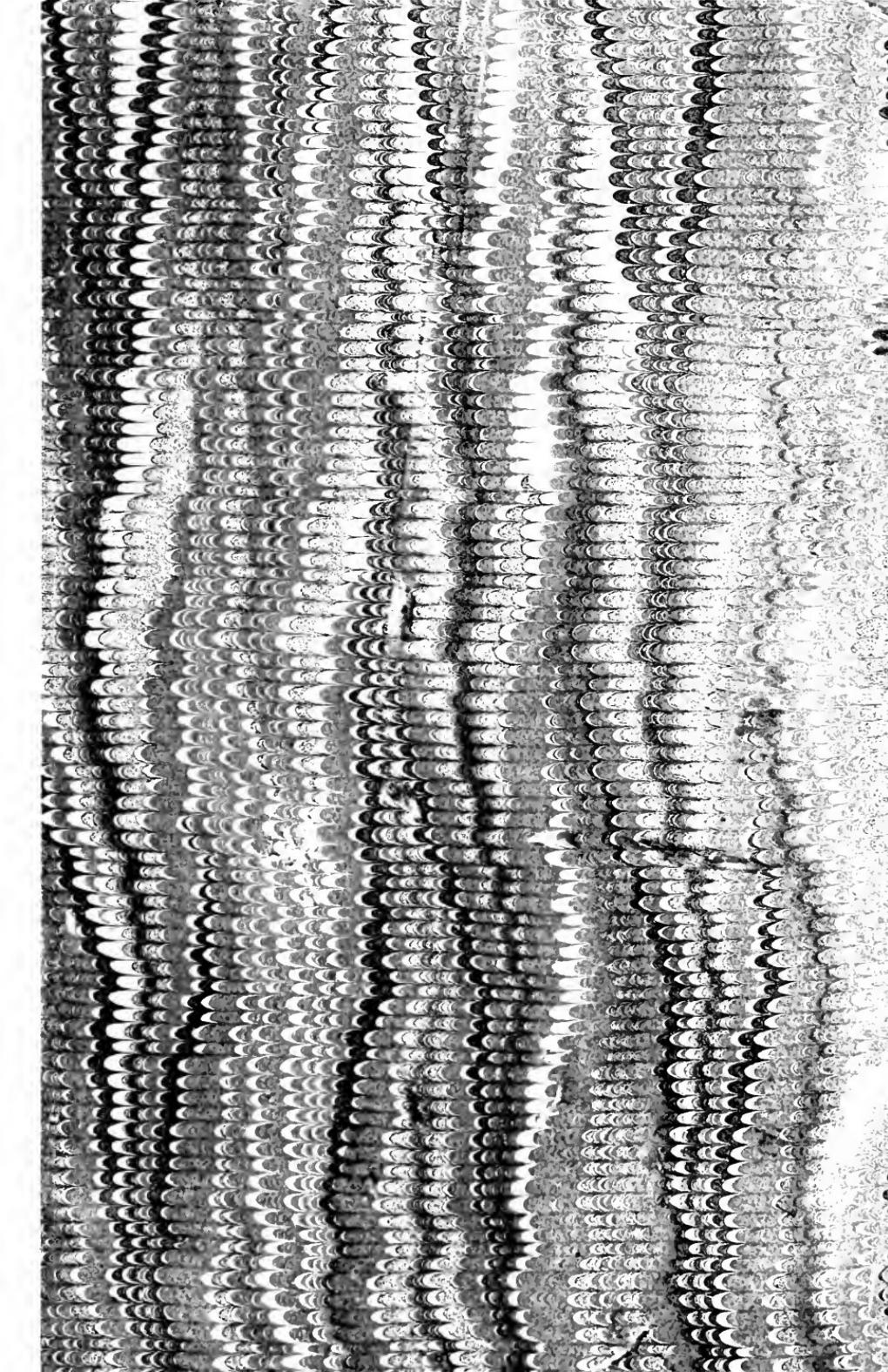


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PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS.
(INSTITUTED 1852.)

VOL. XXVIII. No. 1.
JANUARY, 1902.

Edited by the Secretary, under the direction of the Committee on Publications.
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NEW YORK 1902.

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American Society of Civil Engineers.

OFFICERS FOR 1901.

President, ROBERT MOORE.

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<i>Term expires January, 1903:</i>	<i>Term expires January, 1904:</i>
HENRY S. HAINES,	CHARLES C. SCHNEIDER,
GEORGE H. BENZENBERG,	JOHN R. FREEMAN,

Secretary, CHARLES WARREN HUNT.

Treasurer, JOSEPH M. KNAP.

Directors.

<i>Term expires January, 1903:</i>	<i>Term expires January, 1904:</i>	<i>Term expires January, 1905:</i>
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HENRY B. SEAMAN,	GEORGE F. SWAIN,	GEORGE H. PEGRAM,
THOMAS H. JOHNSON,	EMIL KUICHLING,	WILLIAM J. WILGUS,
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WILLIAM H. KENNEDY,	FRANK C. OSBORN.	JAMES L. FRAZIER.

Assistant Secretary, T. J. McMINN.

Standing Committees.

THE PRESIDENT OF THE SOCIETY IS *ex-officio* MEMBER OF ALL COMMITTEES.

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Special Committees.

ON ANALYSIS OF IRON AND STEEL:—Sub-Committee of the American Society of Civil Engineers (of the International Committee on Standards for the Analysis of Iron and Steel, of which Prof. J. W. Langley is Chairman)—Charles B. Dudley, William Metcalf, Thomas Rodd.

ON UNITS OF MEASUREMENT:—George M. Bond, William M. Black, R. E. McMath, Charles B. Dudley, Alexander C. Humphreys.

ON THE PROPER MANIPULATION OF TESTS OF CEMENT:—George F. Swain, Alfred Noble, George S. Webster, W. B. W. Howe, Louis C. Sabin, S. B. Newberry, Clifford Richardson, Richard L. Humphrey, F. H. Lewis.

The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK.

TELEPHONE NUMBER,	- - -	533 Columbus.
CABLE ADDRESS,	- - -	"Ceas, New York."

AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced
in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

January 8th, 1902.—The meeting was called to order at 8.40 p. m., President J. James R. Croes in the chair; Charles Warren Hunt, Secretary; and present, also, 66 members and 7 guests.

The minutes of the meetings of December 4th and 18th, 1901, were approved as printed in the *Proceedings* for December, 1901.

A paper by Elnathan Sweet, M. Am. Soc. C. E., entitled "Some Important Phases of Canal Navigation, Illustrated by Recent Experiments in Germany," was presented by the Secretary.

There being no discussion on the paper, the President called upon Mr. George W. Fuller to give his impressions of Mexico, which he had recently visited, and at the conclusion of Mr. Fuller's interesting remarks Messrs. W. H. Wiley and George A. Soper supplemented them by statements of personal experience in that country.

Ballots were canvassed and the following candidates declared elected:

AS MEMBERS.

WILLIAM DAVIS BARBER, Chicago, Ill.
CHOKURO KADONO, Tokyo, Japan.
DAVID SIMSON, Buenos Aires, Argentine Republic.

AS ASSOCIATE MEMBERS.

JULIAN DU BOIS, Amsterdam, N. Y.
EDWARD BAYRD FAY, St. Louis, Mo.
JOHN FLYNN, Jr., Troy, N. Y.
EDWIN GRANT LANE, Cleveland, Ohio.
RALPH EELLS NEWTON, Milwaukee, Wis.
CLARENCE DU BOIS POLLOCK, New York City.
WILLIAM STUART SMITH, Rochester, N. Y.
GEORGE EBER STRATTON, Boston, Mass.
CHARLES ELIPHALET TROUT, New York City.

The Secretary announced the election of the following candidates by the Board of Direction on January 7th, 1902:

AS ASSOCIATES.

LESLIE J. BENNETT, Buffalo, N. Y.
CHARLES FRANCIS ASA HENNESSEY, New York City.

AS JUNIORS.

ROBERT HENRY HAMMER, Brooklyn, N. Y.
HARRY GARFIELD HARRINGTON, Newark, N. J.
ABRAHAM UNDERHILL WHITSON, College Point, N. Y.
FREDERICK WILCOCK, Brooklyn, N. Y.
PHILIP HAROLD WINCHESTER, Watertown, N. Y.

The Secretary announced the death of THOMAS CRABB, elected Junior April 4th, 1899; died December 21st, 1901.

The Secretary reported that the ballot on the appointment of a Special Committee on Rail Sections had been canvassed by the Board of Direction, at its meeting on January 7th, 1902, with the following result:

Total ballots received.....	1 098
Without signature.....	14
Not entitled to vote.....	10
Otherwise defective.....	18
	— 42
Total votes counted	1 056
Voted "yes".....	1 014
Voted "no".....	42
	— 1 056

And, inasmuch as the corporate membership on January 7th, 1902, was 2 122, the vote complies with the constitutional provision, and the Committee will be appointed by the Board.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

January 7th, 1902, 8.10 P. M.—President Croes in the Chair; Charles Warren Hunt, Secretary; and present, also, Messrs. Beusel, Briggs, Buchholz, Haines, Hering, Knap, Kuichling, Seaman and Turner.

A payment of \$5 000 on the principal of the mortgage indebtedness of the Society was ordered.

The Annual Report of the Board of Direction for the year ending December 31st, 1901, was adopted.

Ballots on the appointment of a Special Committee to report on Standard Rail Sections were canvassed, with the result that the ballot was decided in the affirmative.*

The appointment of the Special Committee was made a special order for business for the February meeting of the Board.

The following resignations were accepted, taking effect December 31st, 1901.

Malcolm Scollay Greenough, William Louis Marshall, Henry Thompson Douglas, Samuel Hosmer Chittenden, Clifford Stephen Kelsey.

A report was received from the Committee appointed to recommend the award of prizes for the year ending with the month of July, 1901, and the following awards were made by the Board:

The Thomas Fitch Rowland Prize was awarded to Paper No. 881, entitled, "The Ninety-sixth Street Power Station of the Metropolitan Street Railway Company, of New York City," by L. G. Montony, Assoc. M. Am. Soc. C. E.

The Collingwood Prize for Juniors was awarded to Paper No. 883, entitled, "A Proposed Method for the Preservation of Timber," by F. A. Kummer, Jun. Am. Soc. C. E.

It was further resolved that no award of the Norman Medal be made for the year ending with the month of July, 1901.

Applications were considered and other routine business transacted.

Two candidates for Associate and five for Junior were elected.*

Adjourned.

* See page 2.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, February 5th, 1902.—8.30 p. m.—At this meeting ballots for membership will be canvassed, and a paper by Ernest P. Goodrich, Jun. Am. Soc. C. E., entitled "The Supporting Power of Piles," will be presented for discussion.

This paper was printed in the *Proceedings* for December, 1901.

Wednesday, February 19th, 1902.—8.30 p. m.—At this meeting a paper by Walter Loring Webb, Assoc. M. Am. Soc. C. E., entitled "Some Devices for Increasing the Accuracy or Rapidity of Surveying Operations," will be presented for discussion.

This paper was printed in the *Proceedings* for December, 1901.

Wednesday, March 5th, 1902.—8.30 p. m.—At this meeting ballots for membership will be canvassed, and a paper by George S. Morison, Past-President, Am. Soc. C. E., entitled "The Bohio Dam," will be presented for discussion.

This paper is printed in this number of *Proceedings*.

Wednesday, March 19th, 1902.—8.30 p. m.—At this meeting a paper by C. A. P. Turner, M. Am. Soc. C. E., entitled "Thermo-Electric Measurement of Stress," will be presented for discussion.

This paper is printed in this number of *Proceedings*.

ANNUAL CONVENTION OF 1902.

The Thirty-fourth Annual Convention of the Society will be held at Washington, D. C., beginning on Tuesday, May 20th, 1902.

**ANNUAL REPORT OF THE BOARD OF DIRECTION FOR THE
YEAR ENDING DECEMBER 31ST, 1901.**

PRESENTED AT THE ANNUAL MEETING, JANUARY 15TH, 1902.

The Board of Direction, in compliance with the Constitution of the Society, presents its report for the year ending December 31st, 1901.

MEMBERSHIP.

The changes in membership are shown in the following table:

	JAN. 1ST, 1901.			JAN. 1ST, 1902.			LOSSES.			ADDITIONS.			TOTALS	
	Resident.	Non-Resident.	Total.	Resident.	Non-Resident.	Total.	Transfer.	Resignation.	Dropped.	Death.	Transfer.	Election.	Loss.	Gain.
Honorary Members.....	1	8	9	2	8	10	2	1	2	1	1	...	...	1
Corresponding Members.....	3	3	6	2	2	4	1	1	1	1	28	88	38	126
Members.....	280	140	420	286	122	508	1	2	1	2	2	36	98	38
Associate Members.....	142	374	516	161	451	612	34	1	1	1	2	136	98	38
Associates.....	36	65	101	38	73	111	1	1	1	1	2	41	12	3
Juniors.....	99	152	251	101	150	251	40	1	30	1	1	62	62	62
Fellows.....	9	28	37	9	25	34	...	...	...	3	...	...	3	...
Totals.....	567	1770	2337	597	1931	2528	76	9	28	32	76	260	145	336

*34 Associate Members and 4 Juniors.

†1 Associate and 35 Juniors.

‡1 Junior.

The net increase during the year, as shown by the above table, was 191, and it may be of interest in this connection, to give from the records the yearly rate of increase in the total membership.

At the end of 1869 the total membership was 160, and, omitting the class of "Subscribers," which was created in 1882, but does not exist under the present Constitution, the net yearly increase has been as follows:

Year.	Increase.	Year.	Increase.	Year.	Increase.	Year.	Increase.
1870.....	83	1880....	10	1890.....	111	1900....	138
1871.....	36	1881....	46	1891.....	91	1901....	191
1872.....	58	1882....	62	1892.....	111		
1873.....	77	1883....	37	1893.....	89		
1874....	31	1884....	82	1894....	75		
1875.....	47	1885....	50	1895....	114		
1876.....	60	1886....	91	1896....	99		
1877.....	22	1887....	91	1897....	63		
1878.....	19	1888....	133	1898....	47		
1879....	8	1889....	93	1899....	103		

The total increase in the ten years 1870-9 was 441, an average of 44.1			
" " "	1880-9	" 695 "	" 69.5
" " "	1890-9	" 903 "	" 90.3
" " "	two years 1900-1	" 329 "	" 164.5

It will be noticed that up to 1899 no two consecutive years have shown an increase of 100, but that the increase for each of the past three years has been more than 100, which indicates that the present rate of increase is not a spasmodic one due to temporary conditions.

The total number of applications received during the year was 375.

Action taken by the Board has been as follows:

Passed to ballot as Members.....	129
Passed to ballot as Associate Members.....	134
Elected Associates.....	13
Elected Juniors.....	66
Total,.....	342
Applications now awaiting action.....	78

The amount of work demanded in connection with 375 applications, in addition to ordinary correspondence, is very great, as it involves the briefing and typewriting of 2 500 copies of individual records, the forwarding of 10 000 circulars and blanks, and the collation and tabulation for the use of the Board of 2 000 answers from endorsers.

Some idea of the volume of printed matter which it is necessary to issue, under the rules, may be gathered from the following figures for 1901, and it should be remembered that all of this must be prepared with great care from original manuscript applications, which, in form, differ greatly from one another:

	Pages.	No. of words.
10 Blue Lists.....	118	88 500
10 Ballot Lists.....	92	69 000
Reconsideration Notices.....	7	5 250
" Ballots	7	5 250
Total issues.....	224	168 000

This is equivalent to 375 pages, or nearly a volume, of *Transactions*.

In its last Annual Report the Board called the attention of members to the care with which all applications are scrutinized, and to the weight which the Board gives to confidential communications in regard to candidates. It is desired now to emphasize what was there said as

to the best method of preventing the election of an undesirable person, viz., that each member, upon receipt of the Blue List, should forward to the Board any information concerning a candidate which bears upon his eligibility. This would prevent the appearance of the name of an undesirable candidate upon the Ballot List, and would do away with the necessity for a negative ballot.

The losses by death reported during the year number 32. They are as follows:

Members: Charles Kimball Bannister, Daniel P. Bruner, Thomas Curtis Clarke, Henry St. Leger Coppée, John Hislop, George Washington Howell, William Rich Hutton, Andrew Langstaff Johnston, William Bateman Lawson, Trevor McClurg Lentzé, William Ludlow, Thomas Speer McNair, Niles Meriwether, Alfred Petry, George Austin Quinlan, Thomas Laidlaw Raymond, Benjamin Reece, Richard Pennefather Rothwell, George McCracken Rusling, Robert Imlay Sloan, John Larkin Thorndike, Ashley Bemis Tower, Lebbeus Baldwin Ward, Nelson Oliver Whitney.

Associate Members: Paul David Cunningham, Levis Passmore Penny packer.

Associates: Henry Robert Bradbury, James Frederick Lewis.

Junior: Thomas Crabb.

Fellows: James Goodwin Batterson, Albert Conro, Stephen Paschall Morris Tasker.

LIBRARY.

The growth of the Library during the past year has been quite in keeping with the phenomenal increase in the membership. This growth has been due in part to the stimulating effect of the issue of the Catalogue of the Library in the latter part of 1900, and also to special and systematic efforts to complete files of reports and of both foreign and home periodicals, and to the purchase of current textbooks and engineering works in English, German and French. Special donations received through publishers, notices of which have been issued in each monthly number of *Proceedings*, have also helped to swell the list, and a large and valuable bequest from the library of the late Henry B. Hammond was also received.

This increase in accessions has added greatly to the routine library work. The labor and time necessary to enter into correspondence with Railroad Companies, Municipalities, Authors and Publishers and to prepare book notices, catalogue each accession, and prepare and keep up to date copy for subsequent issues of the Library Catalogue has been large; but the Board believes the results obtained, which have been indicated in detail in the monthly *Proceedings*, and are summed up in the comparative statement which follows, have justified the additional expense incurred.

ACCESSIONS DURING THE YEAR 1901.

	Bound Volumes.	Unbound Volumes.	Specifica- tions.	Maps, Photos, Charts, etc.	Total.
Donations—Traceable to Library					
Catalogue.....	88	392	....	1	481
" In answer to special requests	57	2 166	....	....	2 223
" From Publishers...	39	9	....	....	48
" Hammond Bequest..	203	742	4	....	949
" In Regular Course..	250	591	103	118	1 062
Exchange of Duplicates.....	43	1 080	....	....	1 123
By Purchase.....	124	16	....	1	141
Totals.....	804	4 996	107	120	6 027

In addition to the above, there have been received about 800 duplicates and 161 separate numbers to complete files of periodicals, neither of which can appear as accessions.

The yearly accessions during the last six years are given in the following table, which shows that in 1901 there were 532 more accessions than were received in the whole previous five-year period :

Year.	Bound Vols.	Unbound Vols.	Specifi- cations.	Maps. Photos, Charts, etc.	Total.
1896.....	188	630	26	234	1 078
1897.....	323	559	122	176	1 180
1898.....	197	749	285	9	1 240
1899.....	268	375	297	36	976
1900.....	281	359	254	127	1 021
1901.....	804	4 996	107	120	6 027

The Library now contains—

Bound Volumes.....	9 612
Unbound Volumes.....	25 243
Specifications.....	2 563
Maps, Photographs, Charts, etc.....	2 693
Total.....	40 111

The total number of titles in the Library is 18 201.

During the year a careful inspection of some 3 400, more or less complete, volumes of unbound periodicals was made, and the binding of about 1 100 volumes has been undertaken.

To date, 414 of these have been bound and are now on our shelves in accessible and durable form. It is the intention of the Board to

continue this work, in the belief that it is wise to preserve in a reference library, in the most convenient and accessible form, sets of such periodical literature as may be called for, even though references to them are somewhat infrequent.

Since the publication of the Library Catalogue, the Secretary has received from non-resident members quite a number of requests for information concerning engineering references along special lines, and special searches have been made covering these subjects. Typewritten lists of references to the books and periodicals in the Library have been furnished, and these bibliographies have evidently been of much benefit to members.

The Board believes that if the Membership understood that these searches would be made upon request, many would avail themselves of this source of information.

The furnishing of such information involves a considerable expenditure of time on the part of the employees of the Society qualified to collate the special data asked for by individual members, to the exclusion of the prosecution of their ordinary labors, which, while in the same direction, are devoted to the general advantage of the membership.

It has seemed proper, therefore, to the Board, to require that the actual amount of the expenditure incurred in the collation of special information for an individual should be paid for by the applicant for such information. The Secretary, accordingly, has been directed to charge for and collect from members and others to whom special information, which involves research and correspondence not falling within the regular duties of employees of the Society, may be furnished, the actual cost of the extra work necessary to reply to their requisitions.

The following gives the amount expended upon the Library during the year:

Purchase of Books (124 Volumes).....	\$363.98
Expressage, etc.....	47.61
Binding (414 Volumes).....	378.72
Fixtures and Supplies.....	78.45
 Total.....	 \$868.76

The value of the accessions to the Library during the year is as follows, each accession having been valued separately, as received:

5 886 Donations and Exchanges (estimated value) ..	\$2 704.38
141 Purchase (cost)	363.98
 Total.. 6 027.....	 \$3 068.36

PUBLICATIONS.

During the year the usual ten numbers of *Proceedings* and two volumes of *Transactions* have been published, the total number of pages in these publications showing a slight increase over the same publications for last year.

In the last annual report the Board stated that the Secretary had been authorized to prepare a General Index to *Transactions*. During the year this work, which involved the indexing of forty-five volumes, covering 23,370 pages, was completed, and published in September in a separate volume of 244 pages, a copy of which was furnished to each person connected with the Society. This work was performed by the Secretary and the regular office force, in addition to regular duties.

The publication of this Index makes possible the following statement, which would appear to be of interest, the question having often been asked as to the interest taken in the publications by the membership at large.

Of the total living membership of the Society in all grades, it is found that 12% have contributed papers, and that 27% have contributed either papers or discussions, or both.

With a view of ascertaining the effect of the present method of publication on the technical output of the Society the table given below has been prepared.

Period.	Number of volumes.	Total pages.	PAPERS.		DISCUSSIONS.		MEMOIRS.	AVERAGE LENGTH, IN PAGES.		Number of discussions per paper.
			Number.	Total pages.	Number.	Total pages.		Papers.	Discus-	
1872-1877..	6	2,391	152	1,974	278	423	—	13	1.52	1.82
1878-1883..	6	2,570	119	1,934	240	636	—	16.25	2.65	2.01
1884-1889..	9	4,233	159	3,886	609	1,347	—	18.15	2.21	3.83
1890-1895..	13	7,728	330	5,185	1,331	2,537	—	15.29	1.9	3.92
1896-1901..	12	7,020	141	3,410	1,088	3,332	278*	24.18	3.06	7.72
Total and average.	46	23,942	910	15,389	3,546	8,275	278	16.9	2.33	3.90

*Before this period, Memoirs were not published in *Transactions*.

It will be seen that the publications of the Society have been divided into periods of six years each, in the earliest of which no advance copies of papers were issued. From June, 1879, to December, 1895, a few advance copies of papers were printed and sent to members specially selected by the Secretary for the purpose, with a request for

discussion, and, in addition to this, from April, 1892, to the end of 1895 semi-monthly bulletins, containing abstracts of papers to be presented, were regularly issued. During the last six years, all papers have been published in *Proceedings* in advance of the date set for their presentation, and nearly always sufficiently in advance of that date to enable distant members to be represented at the meetings by discussion in writing if they so desired.

During this last period, the amount of output under the several headings, in percentages of the whole, is as follows:

Percentage of the entire time during which publications of the	
Society have been issued.....	16.67
" " Total Volumes.....	26.1
" " " Pages	29.3
" " " Number of Papers.....	15.5
" " " Pages of Papers.....	22.1
" " " Number of Discussions.....	30.7
" " " Pages of Discussion.....	40.3

The figures showing the average length of papers and discussions, and the number of discussions per paper, are perhaps the most significant and interesting, as they indicate, during this last period, a much wider and more carefully prepared discussion than obtained under the old system, and the increase under these headings over the previous average is:

In length of papers.....	55.2 per cent.
" " " discussions.....	52.4 "
In number of discussions per paper.....	141.2 "

The amount of matter in type at the present time is such that it has been decided to publish three volumes during 1902, the first of which will be ready for distribution about April, 1902.

In the *Proceedings* the list of references to current engineering literature (begun in March, 1899) has been regularly kept up, and, during the year, has covered 69 pages, containing 3 161 classified references to 54 periodicals. These references have been collated in scrap books under each of the classified headings, and are thus preserved in the Library for convenient reference.

During the year additional shelving was erected, and the stock of extra numbers of papers, monthly *Transactions* and *Proceedings*, and volumes of *Transactions*, has been carefully inventoried, and stored permanently in accessible form. The cost of each to the Society has

also been determined, and it is found that the Society now has in stock 119 108 copies of its various publications, the actual cost of which has been \$13 931.10. This stock, which is kept for the convenience of members and others, is being largely added to, each year.

Owing to the increase in the number of members who have their volumes of *Transactions* bound in standard style, it has been possible to effect a considerable reduction in the cost of this binding, and this reduced cost has already gone into effect with the binding of Vol. XLVI, the reduction being from \$1.20 to \$1.00 for half morocco, and from 75 cents to 50 cents for cloth bindings.

SUMMARY OF PUBLICATIONS FOR 1901.

	Number Issued.	Total Edition of each.	Number of Pages.	Plates.	Cuts.
<i>Transactions*</i>	2	2 700	1 245	24	182
<i>Proceedings*</i>	10	2 850	1 485	25	245
Constitution and List of Members.....	1	3 000	222	..	...
Advertisements.....	10	2 850	144	..	...
Index to <i>Transactions</i> , Vols. I to XLV.....	1	3 000	244	..	...
Totals .....	..	....	3 340	49	427

The cost of Publications has been:

For Paper, Printing, Binding, etc., <i>Transactions</i> and <i>Proceedings</i>	\$7 950.54
For Plates and Cuts.....	1 087.34
For Boxes, Mailing Lists, Copyright, and Sundry Expenses.....	182.25
For Commission on Advertisements.....	327.67
For 8 525 copies of Papers and Memoirs.....	550.09
For List of Members.....	818.64
For Index to Transactions, Vol. I to XLV.....	650.89
 Total.....	\$11 567.42
Deduct amount received for advertisements.....	\$2 010.00
Deduct amount received for sale of publications..	2 392.08
 —————	4 402.08
 Net cost of Publications for 1901.....	\$7 165.34

* Includes Indexes and Tables of Contents.

MEETINGS.

During the year 24 meetings have been held, as follows: At the Annual Meeting, 2; at the Annual Convention, 4; regular semi-monthly meetings, 18.

At these meetings 15 formal papers, 3 of which were illustrated with lantern slides, 5 topics for informal discussion, and 5 illustrated lectures, were presented.

The Thirty-third Annual Convention was held at the International Hotel, Niagara Falls, N. Y. There were registered at this convention 317 members of the Society, in all grades, accompanied by 311 members of their families.

MEDALS AND PRIZES.

For the year ending with the month of July, 1900, Medals and Prizes were awarded as follows:

The Norman Medal, to James A. Seddon, M. Am. Soc. C. E., for his paper on "River Hydraulics."

The Thomas Fitch Rowland Prize, to Allen Hazen, M. Am. Soc. C. E., for his paper entitled "The Albany Water Filtration Plant."

The Collingwood Prize for Juniors, to Robert P. Woods, Jun. Am. Soc. C. E. (now Assoc. M. Am. Soc. C. E.), for his paper entitled "Street Grades and Cross-Sections in Asphalt and Cement."

FINANCES.

An examination of the Secretary's Statement of Receipts and Disbursements, and of the General Balance Sheet, which accompanies it, shows that, although much additional work has been performed by the office force, as has already been pointed out, the work has been done in an economical manner.

A payment of \$5 000 on the principal of the mortgage indebtedness was made, and an additional payment of \$5 000 has been ordered in 1902. These two payments, which carry out the recommendation of the Board of January, 1900, that a sum approximately equal to the amount of Entrance Fees received each year be applied to extinguishing the debt, will bring the amount paid for this purpose during three years to \$20 000, and reduce the debt to \$65 000.

CONCLUSION.

The condition of the Society, at the beginning of its fiftieth year of existence, shows that it has been successful in the accomplishment of the purposes for which it was organized, as set forth by its founders.

These objects, as stated in the Constitution, are: "The advancement of engineering knowledge and practice, and the maintenance of a high professional standard among its members."

How the "means to be employed for this purpose" have been strengthened during recent years, has been set forth annually in the reports of the Board. The progress made in the holding of regular and successful "meetings for the presentation and discussion of appropriate papers, and for social and professional intercourse;" in the "publication of such papers and discussions as may be expedient"; and in "the maintenance of a library, the collection of maps, drawings and models, and the establishment of facilities for their use" seems to be gratifying and satisfactory.

The Society House, which has now been occupied for more than four years, has proved to be adequate in size and convenient in arrangement for carrying on the increasing work, and the provision made for future expansion seems to be ample for many years to come.

In view of the large number of elections during the past year, and the increasing ratio of yearly additions to the total membership, it seems proper to emphasize the fact that this is not the result of any change in the requirements for admission, but is, on the contrary, in spite of the maintenance of a higher standard of eligibility, and the most careful scrutiny of the qualifications of each candidate.

The Reports of the Secretary and the Treasurer are appended.

By order of the Board,

CHAS. WARREN HUNT,

Secretary.

NEW YORK, January 7th, 1902.

GENERAL BALANCE SHEET, DECEMBER 31ST, 1901.
Accompanying Report of the Secretary.

ASSETS.	LIABILITIES.
Building and Lot (cost)	\$191 730.26
Furniture (cost)	15 303.96
Publications on hand; inventoried value ..	13 931.10
Library:	
Cash expended for Books, etc.	\$5 608.76
Estimated Value of Dona- tions	<u>37 778.32</u>
,, " Non-Members, for Pub- lications	596.51
,, for Advertising	<u>842.50</u>
Cash	<u>15 933.31</u>
	<u>\$285 648.98</u>
	<u>\$285 648.98</u>
*These funds have been derived from the following sources:	
Norman Metal Fund.....	\$1 000.00
Rowland Prize Fund.....	1 222.50
Collingwood Prize Fund.....	1 000.00
Bonations to Building Funds.....	45 479.50
Profit on 23d St. House and on Securities.....	20 319.92
Profit on sale of Historical Sketch.....	1 493.66
Income Account.....	76 328.55
McCrea-Swift Fund.....	1 000.00
Fellowship Fund.....	13 058.28
Compounding Dues Fund.....	6 440.00
Donations to Library, valued at.....	<u>37 778.32</u>
	<u>\$285 648.98</u>
The Norman Metal, Rowland Prize and Collingwood Prize Funds no longer exist as such; the obligations under them having been assumed by the Society, with the consent of the donors.	
Dues for 1902, paid in advance.....	\$10 548.83
Mortgage Debt	70 000.00
*Funds invested in Society House and Lot, and Library	205 100.15

REPORT OF THE SECRETARY, FOR THE

To THE BOARD OF DIRECTION OF THE

GENTLEMEN,—I have the honor to present a statement of Re-
December 31st, 1901. There is also presented a general balance sheet
NEW YORK, January 7th, 1902.

RECEIPTS.

Balance on hand December 31st, 1901, in Bank and Trust Company and in hands of the Treasurer.....	\$9 929.82
Entrance Fees.....	\$6 595.00
Current Dues.....	28 722.93
Past Dues.....	1 191.22
Advance Dues.....	10 548.83
Certificates of Membership	254.45
Badges.....	1 117.50
Sales of Publications.....	2 391.58
Advertisements.....	2 010.00
Interest.....	157.82
Compounding Dues.....	575.00
Library.....	6.00
Convention.....	275.00
Annual Meeting.....	854.00
Binding.....	1 745.00
Miscellaneous.....	51.46
Historical Sketch.....	5.00

	56 500.79

S66 430 61

YEAR ENDING DECEMBER 31ST, 1901.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

ceipts and Disbursements for the fiscal year of the Society, ending showing the condition of the affairs of the Society.

Respectfully submitted,

CHAS. WARREN HUNT.

Secretary.

DISBURSEMENTS.

Salaries of Officers.....	\$8 199.96
Clerical Help.....	7 822.93
Caretaking.....	1 417.53
Publications.....	11 372.24
Postage.....	2 817.97
General Printing and Stationery.....	1 681.79
Badges.....	907.40
Certificates of Membership.....	127.25
Binding.....	1 802.86
Library.....	868.76
Maintenance of House.....	156.96
Heat, Light and Water.....	873.90
Betterments.....	214.50
Furniture.....	749.59
Annual Meeting.....	1 320.57
Convention.....	874.51
Prizes	179.90
Advertising Commission.....	327.67
Interest and Insurance.....	3 190.00
Petty Expenses	201.97
Society House Loan.....	5 000.00
Current Business.....	307.29
Refund, Sale of Publications.....	21.75
	----- \$50 437.30

Balance on hand December 31st, 1901:

In Union Trust Company.....	\$7 255.06
In Garfield National Bank.....	7 753.25
In hands of Treasurer.....	985.00
	----- 15 993.31

	\$66 430.61

REPORT OF THE TREASURER.

In compliance with the provision of the Constitution, the Treasurer presents the following report for the year ending December 31st, 1901:

Balance on hand December 31st, 1900.....	\$9 929.82
Receipts from current sources January 1st to December 31st, 1901	56 500.79
Payment on audited vouchers for current business, January 1st to December 31st, 1901.....	\$45 437.30
Payment on principal of Bond and Mortgage.....	5 000.00
Balance on hand December 31st, 1901:	
In Union Trust Company.....	\$7 255.06
In Garfield National Bank.....	7 753.25
In hands of the Treasurer.....	985.00
	15 993.31
	<hr/>
	\$66 430.61
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Respectfully submitted,

JOSEPH M. KNAP,

Treasurer, Am. Soc. C. E.

NEW YORK, January 7th, 1902.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(December 12th, 1901, to January 7th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal, Assoc. Eng. Soc.*, 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings, Eng. Club of Phila.*, 1122 Girard St., Philadelphia, Pa.
- (3) *Journal, Franklin Inst.*, Philadelphia, Pa., 50c.
- (4) *Journal, Western Soc. of Eng.*, Monadnock Block, Chicago, Ill.
- (5) *Transactions, Can. Soc. C. E.*, Montreal, Que., Can.
- (6) *School of Mines Quarterly*, Columbia Univ., New York City, 50c.
- (7) *Technology Quarterly*, Mass. Inst. Tech., Boston, Mass., 75c.
- (8) *Stevens Institute Indicator*, Stevens Institute, Hoboken, N. J., 50c.
- (9) *Engineering Magazine*, New York City, 30c.
- (10) *Cassier's Magazine*, New York City, 25c.
- (11) *Engineering* (London), W. H. Wiley, New York City, 35c.
- (12) *The Engineer* (London), International News Co., New York City, 35c.
- (13) *Engineering News*, New York City, 15c.
- (14) *The Engineering Record*, New York City, 12c.
- (15) *Railroad Gazette*, New York City, 10c.
- (16) *Engineering and Mining Journal*, New York City, 15c.
- (17) *Street Railway Journal*, New York City, 35c.
- (18) *Railway and Engineering Review*, Chicago, Ill.
- (19) *Scientific American Supplement*, New York City, 10c.
- (20) *Iron Age*, New York City, 10c.
- (21) *Railway Engineer*, London, England.
- (22) *Iron and Coal Trades Review*, London, England.
- (23) *Bulletin, American Iron and Steel Assoc.*, Philadelphia, Pa.
- (24) *American Gas Light Journal*, New York City, 10c.
- (25) *American Engineer*, New York City, 20c.
- (26) *Electrical Review*, London, England.
- (27) *Electrical World and Engineer*, New York City, 10c.
- (28) *Journal, New England Water-Works Assoc.*, Boston, 75c.
- (29) *Journal, Society of Arts*, London, England.
- (30) *Annales des Travaux Publics de Belgique*, Brussels, Belgium.
- (31) *Annales de l'Assoc. des Ing. Sortis des Ecole Spéciales de Gand*, Brusseis, Belgium.
- (32) *Mémoires et Compte Rendu des Travaux*, Soc. Ing. Civ. de France, Paris, France.
- (33) *Le Génie Civil*, Paris, France.
- (34) *Portefeuille Économique des Machines*, Paris, France.
- (35) *Nouvelles Annales de la Construction*, Paris, France.
- (36) *La Revue Technique*, Paris, France.
- (37) *Revue de Mécanique*, Paris, France.
- (38) *Revue Générale des Chemins de Fer et des Tramways*, Paris, France.
- (39) *Railway Master Mechanic*, Chicago, Ill.
- (40) *Railway Age*, Chicago, Ill., 10c.
- (41) *Modern Machinery*, Chicago, Ill., 10c.
- (42) *Transactions, Am. Inst. Elec. Engrs.*, New York City, 50c.
- (43) *Annales des Ponts et Chaussées*, Paris, France.
- (44) *Journal, Military Service Institution, Governor's Island*, New York Harbor, 75c.
- (45) *Mines and Minerals*, Scranton, Pa., 20c.
- (46) *Scientific American*, New York City, 10c.
- (47) *Mechanical Engineer*, Manchester, England.
- (48) *Proceedings, Eng. Soc.*, W. Pa., 110 Penn Ave., Pittsburg, Pa., 50c.
- (49) *Transactions, Mining Institute of Scotland*, London and Newcastle-upon-Tyne.
- (50) *Municipal Engineering*, Indianapolis, Ind., 25c.
- (51) *Proceedings, Western Railway Club*, 225 Dearborn St., Chicago, Ill., 25c.
- (52) *American Manufacturer and Iron World*, 59 Ninth St., Pittsburg, Pa.
- (53) *Minutes of Proceedings, Inst. C. E.*, London, England.
- (54) *Power*, New York City, 10c.
- (55) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.

LIST OF ARTICLES.

Bridge.

- Notes on Protection of Metal Work of Ballasted Bridge Floors. W. H. Finley. (4) Dec.
 The Interprovincial Bridge at Ottawa.* (14) Serial beginning Dec. 7, ending Dec. 14.
 The Middletown (Conn.) Bridge—The Longest Highway Draw Span.* H. G. Tyrrell. (15) Dec. 27.
 The Little Calumet River Drawbridge.* (14) Dec. 28.
 The New East River Bridge: Its Present Condition Shown Photographically.* (20) Jan. 2.
 Chicago, Milwaukee & St. Paul Bridge at Minneapolis.* (40) Jan. 3.
 The Drafting Room of a Bridge Office. R. G. Manning. (14) Jan. 4. (Reprint from the *Technic*, 1900.)
 Le Pont J. F. Lepine, à Paris.* J. Hervien. (35) Serial beginning Oct., ending Dec.

Electrical.

- The Bay Ridge Station of the Edison Electric Light Co. of Brooklyn.* (64) Dec.
 The Crawford-Voelker Incandescent Electric Lamp. F. Z. Maguire. (26) Dec. 6.
 Electricity Supply Meters. J. R. Dick. (47) Dec. 14.
 The Stray Power Method of Testing Direct-Current Motors and Generators. Wm. Lincoln Smith. (27) Dec. 14.
 Lighting and Railway Development on Staten Island. Max Loewenthal. (27) Dec. 28.
 Alternators with Dampers. J. Fischer-Hinnen. (27) Dec. 28.
 The Shaly-Arco Portable Field Equipment for Wireless Telegraphy.* A. Frederick Collins. (46) Dec. 28.
 The Electric Incandescent Lamp; How It Is Made and Tested in the United States.* Bernard V. Swenson. (10) Jan.
 The Economy of Isolated Electric Plants. Isaac D. Parsons. (9) Jan.
 The Operation of the Rotary Converter.* David B. Rushmore. (9) Jan.
 Wireless Telegraphy: Its Past and Present Status and Its Prospects.* William Maver, Jr. (10) Jan.
 The New Power Station of the New York Edison Company.* (14) Jan. 4.
 Moteurs et Combinateurs Électriques pour Voitures Automobiles. Joseph Rosset. (34) Serial beginning Sept., ending Dec.

Marine.

- Power Consumed in Propelling the Whitehead Torpedo.* Frank M. Leavitt. (20) Dec. 12.
 Battleships (of the American Navy).* (46) Dec. 14.
 Monitors (of the American Navy).* (46) Dec. 14.
 Latest Types of Naval Guns.* (46) Dec. 14.
 Armored Cruisers (of the American Navy).* (46) Dec. 14.

Mechanical.

- Compressed Air Hoisting Plants. Richard Hirsch. (58) Dec.
 Some Aeronautical Experiments. Wilbur Wright. (4) Dec.
 Engines at the Glasgow Exhibition.* (64) Dec.
 A Large Boiler Stoking Plant.* (12) Dec. 6.
 Some Details of Construction in Heavy Motor Vehicles.* (47) Dec. 7.
 Machine Tools and Their Use in Locomotive Works.* (12) Dec. 13.
 Working Loads for Manila Rope. C. W. Hunt. (13) Dec. 12; (14) Dec. 14.
 About Smoke Consumers.* D. B. Dixon. (62) Dec. 19.
 The Franklin Water Tube Boiler.* (20) Dec. 19.
 Stanley Works, Newark-on-Trent.* (12) Dec. 20.
 Elevators for Tall Office Buildings: The Problem of Efficient Service. Reginald Pelham Bolton. (10) Jan.
 Hoisting Machinery; Its Increasing Importance and Development.* Joseph Horner. (10) Jan.
 A Smokeless London: The Promise of Gaseous Fuel and Electricity. W. C. Popplewell. (10) Jan.
 The "Brighton" Gas Engine.* (62) Jan. 2.
 Winding Field Coils from Flat Copper Strips.* (20) Jan. 2.
 High Pressure Gas Lighting. W. H. Casney. (24) Jan. 6.
 Les Embraiages.* M. Euverte. (37) Nov.
 Manutention Mécanique du Charbon et du Coke dans les Usines à Gaz de Dijon et du Havre.* J. Laverrière. (33) Dec. 7.
 La Vapeur Surchauffée et le Surchauffeur Schwoerer. (36) Dec. 10.
 Les Nouveaux Laboratoires de l'École Technique Supérieure de Stuttgart.* (33) Dec. 14.
 Applications Industrielles des Turbines à Vapeur Parsons.* M. Duchanoy. (33) Dec. 21.

Metallurgical.

- A Japanese Copper Reduction Works.* W. L. Hildburgh. (6) Nov.
 The Early History of Open-Hearth Steel Manufacture in the United States. Samuel T. Wellman, M. Am. Soc. M. E. (13) Dec. 12.
 Alloys as Solutions. John Alexander Matthews. (16) Dec. 21.
 Modern Iron Blast-Furnace Practice.* Frank Hearne Crockard. (9) Jan.

Military.

Late Developments in Ordnance and Armor. J. F. Meigs. (19) Dec. 14.
 Range-Finders. George Forbes. (29) Dec. 20.

Mining.

The South Lesmahagow Coal-Field. J. M. Cairneross. (59) Vol. xxii, Pt. 4.
 Washing of Bituminous Coals by the Luhrig Process.* J. V. Schaefer. (4) Dec.
 Copper Mining in Japan. E. W. Jardin. (16) Dec. 28.

Railroad.

The Abolition of Grade Crossings on the Providence Division of the New York, New Haven and Hartford Railroad between Boston and Dedham. Arthur S. Tuttle. (1) Nov.

Some Problems in Maintenance Arising from Rapid Increase in Air-Brake Equipment. E. M. Herr. (61) Nov.

What shall be done to Maintain the Air Brake Equipment on our Freight Cars. T. W. Demearest. (61) Nov.

Locomotive Combustion. J. W. Shepherd. (61) Nov.

The New Victoria Station at Nottingham. (11) Serial beginning Nov. 15, ending Dec. 20.

Oil Fuel for Locomotives: Practice on the Pacific Coast.* H. B. Gregg. (25) Serial beginning Dec., ending Jan.

Economy in Locomotive Service. G. R. Henderson. (15) Serial beginning Dec. 6, ending Dec. 13.

Port Richmond Terminal of the Philadelphia & Reading Ry.* (18) Dec. 14.

The Pennsylvania and Long Island R. R. Extensions across the North and East Rivers.* (13) Dec. 19.

The Player-Baldwin Oil-Burning Consolidation Locomotive—Atchison, Topeka & Santa Fe.* (15) Dec. 20.

Rail Rolling at Lower Temperatures during 1901.* S. S. Martin. (20) Dec. 26.

The Field Practice of Relining Railway Curves. Howard C. Ives. (13) Dec. 26.

New Yards and Shops of the Central Railroad of New Jersey, at Elizabethport, N. J.* (15) Serial beginning Dec. 27, ending Jan. 3.

Comparative Locomotive Tests, Michigan Central and Illinois Central Roads. (18) Dec. 28.

Vanderbilt Steel Tank Car, 12,000 Gallons Capacity.* (25) Jan.

A Brooks "Chautauqua" Type Locomotive—Central Railroad of New Jersey.* (25) Jan.; (15) Jan. 3; (18) Jan. 4.

Chautauqua Type Passenger Locomotive—Buffalo, Rochester & Pittsburg Railway.* (39) Jan.

Collinwood Roundhouse, Lake Shore & Michigan Southern Railway.* (25) Jan.

Heavy Consolidation Compound Locomotive, Atchison, Topeka & Santa Fe Railway.* (25) Jan.

Four-Cylinder Balanced Compound Locomotive: A Design by Charles M. Muchnic.* (25) Jan.

Drawing Room: Chief Engineer's Office: Pittsburg & Lake Erie R. R., Pittsburg, Pa.* R. P. Forsberg. (13) Jan. 2.

Switching Yards of the Chicago Transfer & Clearing Co.* (13) Jan. 2.

Les Locomotives à l'Exposition de 1900: Locomotives Américaines. F. Barbier. (38) Dec.

Railroad, Street.

The Wannsee-Berlin Electric Railway.* (12) Dec. 6.

Shallow Underground Tramways. C. H. Worthingham, M. Inst. C. E. (26) Dec. 13.

Sprague Multiple Unit System, as Applied on the Boston Elevated Railway.* Frank J. Sprague. (26) Serial beginning Dec. 13, ending Dec. 27.

Street Railway Track Construction at Scranton, Pa.* (13) Dec. 26.

The Street Railway Company of Hamburg, Germany.* Heinrich Vellguth. (17) Jan. 4.

The Brighton Corporation Tramways.* (17) Jan. 4.

The Portsmouth Electric Tramways.* (17) Jan. 4.

Stock Rooms and Stockkeeping of the Metropolitan Street Railway Company, New York City.* (17) Jan. 4.

Le Matériel Roulant des Tramways à l'Exposition de 1900. Raymond Godfernaux. (38) Dec.

Sanitary.

The Sewerage of New Orleans.* W. T. Crofts. (1) Nov.

The Pollution of Streams by Manufactured Wastes, and Methods of Prevention. H. W. Clark. (28) Dec.

Refuse Destruction.* J. A. Priestley. (47) Dec. 7.

Sewage Disposal at Wauwatosa, Wis.* (14) Dec. 14.

The Melbourne and Metropolitan Sewerage System.* (14) Dec. 21.

Ventilation of an Office Building in Hartford.* (14) Dec. 21.

The Aramingo Drainage System, Philadelphia. Geo. E. Datesman. (14) Dec. 28.

Plumbing in the Tombs Prison, New York.* (14) Jan. 4.

Ventilateur "Sirocco" Système Davidson.* A. Soult. (36) Dec. 10.

Structural.

- The Coefficient of Expansion of Concrete.* Wm. D. Pence. (4) Dec.
 The Identification of Wool.* Herbert Stone. (29) Dec. 6.
 Some Interesting Features of Recent Chimney Construction.* (13) Dec. 19.
 Tests of Fireproof Partitions by the New York Building Department.* (13) Dec. 26.
 The Weehawken Elevator.* (14) Dec. 28.
 Practical Application of Reinforced Concrete. Jacques Boyer. (9) Jan.
 A Steel Frame Foundry Building.* (14) Jan. 4.
 Les Planchers en Béton Armé de Métal Déployé: Système Golding.* (36) Nov. 25.
 Des Applications du Ciment Armé. G. Liébeaux. (38) Dec.

Water Supply.

- Protection of Water Pipe from Electrolysis. E. B. Ellicott. (4) Dec.
 The Bacteriological Analysis of Water and Its Interpretation. Charles Edward Amory Winslow. (28) Dec.
 The Work of Sanitary Inspection of the Metropolitan Water-Works. William W. Locke. (28) Dec.
 Experiences in Reducing Water Ram Caused by Direct-Acting Pumping Engines. George E. Winslow. (28) Dec.
 Water Supplies of Vermont. Charles P. Moat. (28) Dec.
 Fall of the Fairhaven Water Tower.* R. C. P. Coggeshall. (28) Dec.
 Clearing and Enlarging the Spot Pond Storage Reservoir, Metropolitan Water Supply.* Caleb Mills Saville, M. Am. Soc. C. E. (13) Dec. 12.
 A "Tangential Impact" Water Wheel.* (13) Dec. 12.
 The Needless Changes in the Jerome Park Reservoir Construction.* Alfred Craven, M. Am. Soc. C. E. (13) Dec. 19.
 Water Power Development at Hannawa Falls. Wallace C. Johnson. (20) Dec. 26.
 The Red Bridge Power Station of the Ludlow Manufacturing Company.* (14) Dec. 28.
 Niagara Falls Power: The Organization of the Operating Department of the Niagara Falls Power Company.* Philip P. Barton. (10) Jan.
 A Rock-Fill Dam with Steel Core across East Canyon Creek, Utah.* W. P. Hardesty. (13) Jan. 2.

Waterways.

- The Lower Mississippi: Physical Characteristics, Methods of Improvement, Character and Volume of Traffic.* J. A. Ockerson. (1) Nov.
 Present Condition of the Panama Canal. Gen. Henry L. Abbot. (9) Jan.

* Illustrated

ACCESSIONS TO THE LIBRARY.

DONATIONS.*

(From December 12th, 1901, to January 7th, 1902.)

THE CONSTRUCTION OF FOUNDRY PATTERNS.

An Elementary Manual for Engineering Students and Apprentices. By Herbert Aughtie, A. M. I. M. E. Cloth, $8\frac{1}{2}$ x 6 ins., 8 + 166 + 2 pp., illus. The Scientific Publishing Company, Manchester, 1901. 5 shillings net.

In this work the author has endeavored to produce a textbook dealing with the principles of pattern making in such a way as to meet the requirements of engineering apprentices and students, though doubtless much of the information given will be found of value also to experienced workmen and foremen. In the treatment of the subject, brevity in the text has been aimed at, coupled with very full illustrated examples; and the examples have, as far as possible, been fully dimensioned, so that the bearing of the particular methods used may be more clearly apprehended. Foundry methods are frequently discussed, as the construction of a pattern very often cannot be undertaken until the method of moulding is decided upon. The first chapter contains a brief account of the method of moulding simple patterns in green sand, with such fundamental rules of pattern construction as apply practically to all cases. The following chapter discusses such complications of the mould as necessitate the use of loose parts in the pattern. Chapters III to VIII deal with the construction of circular patterns and the economy in the cost of patterns due to the use of skeleton patterns, loam patterns and loam moulds. Patterns of a more elaborate nature, such as those required for steam cylinders, toothed wheels, etc., are considered in the next four chapters, while the concluding chapter is devoted to a description of such machinery as is necessary or desirable in a pattern shop. There is an index of two pages.

HAND BOOK OF TIMBER PRESERVATION.

By Samuel M. Rowe, M. Am. Soc. C. E. and M. W. S. E. Souvenir Edition. Leather, 6 x 4 ins., 61 + 8 pp., illus. Chicago, Pettibone, Sawtell & Co., Printers, 1900. (Donated by the Author.)

The primary purpose of this little book, as stated in the introductory remarks, is to furnish and collate such information as to the practical workings of the preservation of timber as shall enable the operator to understand fully the philosophy and principles involved, and to serve as a handbook of information, both during the construction and operation of the works. The zinc-tannin, or Wellhouse, process is treated of at length, while the Burnett and creosote processes are noticed only incidentally.

STANDARDS FOR STRUCTURAL DETAILS.

American Bridge Company, Engineering Department. Cloth, 10 x $6\frac{1}{2}$ ins., 102 pp., tab., illus. 1901. (Donated by the American Bridge Company.)

In order to obtain uniformity, these standards have been prepared for use in the various engineering offices of the American Bridge Company to assist the engineers and draftsmen in making detailed and shop drawings. The present edition is a revision of former standards. The preface states that they have been revised from time to time in order to keep pace with the progress made in the art of designing, and that particular effort has been made to have them adapted to the latest improvements in tools used in bridge construction. The Contents are: Beams and Channels; Angles; Tees; Z-Bars; Rivets and Bolts; Pins and Nuts; Eyebars; Rods; Flooring; Miscellaneous; Tables; Sample Drawings; Corrugated Steel Windows and Doors; Rules for Making Shop-Drawings; Appendix.

COURS DE TRAVAUX MARITIMES

Professé à l'École Nationale des Ponts et Chaussées. Par Le Baron Quinette de Rochemont et M. Henry Desprez. Cloth, 11 x $7\frac{1}{2}$ ins., 2 vols and atlas, illus. Paris, Ch. Béranger, 1900. 40 francs. (Donated by Baron Quinette de Rochemont.)

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

The following gifts have also been received:

- | | |
|---|--|
| Adams, Edward A. 1 bound vol. | McCann, T. H. 2 maps. |
| Am. Soc. Mech. Engrs. 1 bound vol. | Mass., State Board of Health. 1 bound vol. |
| Am. Water-Works Assoc. 1 pam. | New England Cotton Mfrs. Assoc. 1 bound vol. |
| Boston Pub. Lib. 1 vol. | N. Y. State College of Forestry. 1 pam. |
| Boston Transit Comm. 1 bound vol. | North, Edward P. 1 pam. |
| Buck, L. L., and Nichols, O. F. 1 bound vol. | North of England Inst. Min. and Mech. Engrs. 1 pam. |
| Casper, C. M., Co. 1 bound vol. | Oesterreichischer Ingenieur- und Architekten-Verein. 23 vols., 71 nos. |
| Collingwood, Francis. 3 pam. | Philosophical Soc. of Glasgow. 1 vol. |
| Colo. Agricultural Exper. Station. 1 pam. | Schieren, Chas. A. 3 bound vol. |
| Columbia Univ. 1 no. | Thompson, Robt. A. 1 pam. |
| Detroit Board of Water Commrss. 1 pam. | U. S. War Dept. 1 bound vol., 2 vol., 35 pam. |
| Duluth City Officers. 1 pam. | Vierendeel, A. 1 pam. |
| Endicott, Mordecai T. 1 pam. | Wash. Bureau of Statistics. Agriculture and Immigration. 1 vol. |
| Indian Midland Ry. Co. 1 pam. | |
| Inst. of Civ. Engts. of Ireland. 3 bound vol., 9 pam. | |
| Lange, Gunardo. 1 pam. | |

BY PURCHASE.

Les Automobiles Électriques. Par Gaston Sencier et A. Delasalle, avec une Préface de Charles Jeantaud. Paris, Ch. Dunod, 1901.

Recherches Expérimentales sur le Matériel de la Batellerie. Par F. B. de Mas. Paris, Imprimerie Nationale, 1891-1897.

Technische Hülfsmittel zur Beförderung und Lagerung von Sammelkörpern (Massengütern). Von M. Buhle. I. Teil. Berlin, Julius Springer, 1901.

Geographische Abhandlungen. Herausgegeben von Prof. Dr. Albrecht Penck in Wien. 7 vols. in 14. Wien, Eduard Hölszel, 1886-1900.

Reminiscences of General Herman Haupt, giving Hitherto Unpublished Official Orders, Personal Narratives of Important Military Operations, and Interviews with President Lincoln, Secretary Stanton, General-in-Chief Halleck, and with Generals McDowell, McClellan, Meade, Hancock, Burnside, and Others in Command of the Armies in the Field, and his Impressions of These Men. Written by Himself, with Notes and a Personal Sketch by Frank Abial Flower. Milwaukee, Wright & Joys Co., 1901.

Sanitary Engineering. A Practical Treatise on the Collection, Removal and Final Disposal of Sewage and the Design and Construction of Works of Drainage and Sewerage, with a Special Chapter on the Disposal of House Refuse and Sewage Sludge, and Numerous Hydraulic Tables, Formulae and Memoranda, including an Extensive Series of Tables of Velocity and Discharge of Pipes and Sewers Specially Computed by Ganguillet and Kutter's Formula. By Colonel E. C. S. Moore, R. E. New York, Longmans, Green & Co.; London, B. T. Batsford, 1898.

Zeitschrift des Vereines Deutscher Ingenieure (to complete set) 1 no.

SUMMARY OF ACCESSIONS.

December 12th, 1901, to January 7th, 1902.

Donations (including 3 duplicates and 72 numbers completing volumes of periodicals).....	181
By Purchase (including 1 number completing volume of periodical).....	7
Total.....	188

MEMBERSHIP.

ADDITIONS.

MEMBERS.	Date of Membership.
BEARDSLEY, JAMES WALLACE, Jun. Eng., U. S. Engrs., Old Custom House, Detroit, Mich.....	Dec. 4, 1901
DOUGLAS, EDWARD MOREHOUSE, Care, U. S. Geological Survey, Washington, D. C	Dec. 4, 1901
HOLGATE, HENRY, McKinnon Bldg., Toronto, Ont., Canada	Oct. 2, 1901
JOHNSON, LUCIEN SAMUEL, Jun. Eng., U. S. Inspector, U. S. Eng. Dept., Jamestown, R. I.....	Dec. 4, 1901
MACKENZIE, WILLIAM BROUARD, Chf. Eng. Intercolonial Ry. of Canada, Moncton, { Jun. N. B., Canada..... { M.	June 7, 1882 April 3, 1901
MAITLAND, ALEXANDER, Jr., Contr. Eng., American Bridge Co., 514 N. Y. Life Bldg., Kansas City, Mo.....	Nov. 6, 1901
TONE, SUMNER LA RUE, 5607 Howe St., Pittsburg, Pa.....	Dec. 4, 1901
TUCKER, LESTER WALDO, Asst. Eng., B. & M. R. R., Boston, Mass.....	Dec. 4, 1901
WALLACE, JOSEPH HARRISON, 908 Temple Court Bldg., New York City.....	Dec. 1, 1896 Dec. 1, 1897 Nov. 6, 1901

ASSOCIATE MEMBERS.

BELLOWS, OSCAR FRANCIS, U. S. Supt. of Constr., Fort Morgan, Ala.	Dec. 4, 1901
DOWNMAN, JULIAN ROMNEY, Mgr., Teche Constr. Co., Jeanerette, La.	Dec. 4, 1901
HILL, CURTIS, Sewer Dept., City Hall, St. Louis, Mo.	Oct. 2, 1901
HUNTER, ROBERT EASTON, 644 St Denis St., Montreal, Que., Canada	Nov. 6, 1901

JUNIORS.

JUNIOR.	
ADAMS, ARTHUR, 132 Oneida St., Utica, N. Y.	Oct. 1, 1901
IVES, HOWARD CHAPIN, Worcester Polytechnic Institute, Worcester, Mass.	Dec. 3, 1901
RYAN, MICHAEL HEALY, Asst Eng., Rapid Transit R. R., 1161 Amsterdam Ave., New York City.	Dec. 3, 1901

RESIGNATIONS.

MEMBERS.

	Date of Resignation.
DOUGLAS, HENRY THOMPSON.....	Dec. 31, 1901
GREENOUGH, MALCOLM SCOLLAY	Dec. 31, 1901
KELSEY, CLIFFORD STEPHEN.....	Dec. 31, 1901
MARSHALL, WILLIAM LEWIS.....	Dec. 31, 1901

DEATHS.

CRABB, THOMAS..... Elected Junior April 4th, 1899; died Dec. 21st, 1901
 REECE, BENJAMIN..... Elected Member March 2d, 1881; died Dec. 17th, 1901
 STIKRUD, MARTINIUS . . Elected Member April 3d, 1889, died Dec. 28th, 1901

PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS.
(INSTITUTED 1852.)

VOL. XXVIII. No. 2.
FEBRUARY, 1902.

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of presentation to the Society, are given.

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Papers and DiscussionsPages 71 to 188.

NEW YORK 1902.

Entered according to Act of Congress, by the AMERICAN SOCIETY OF CIVIL ENGINEERS
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American Society of Civil Engineers.

OFFICERS FOR 1902.

President, ROBERT MOORE.

Vice-Presidents.

<i>Term expires January, 1903:</i>	<i>Term expires January, 1904:</i>
HENRY S. HAINES,	CHARLES C. SCHNEIDER.
GEORGE H. BENZENBERG,	JOHN R. FREEMAN,

Secretary, CHARLES WARREN HUNT.

Treasurer, JOSEPH M. KNAP.

Directors.

<i>Term expires January, 1903:</i>	<i>Term expires January, 1904:</i>	<i>Term expires January, 1905:</i>
JOHN F. O'ROURKE,	JOSIAH A. BRIGGS,	RICHARD S. BUCK,
HENRY B. SEAMAN,	GEORGE F. SWAIN,	GEORGE H. PEGRAM,
THOMAS H. JOHNSON,	EMIL KUICHLING,	WILLIAM J. WILGUS,
JOSEPH RAMSEY, JR.,	MORDECAI T. ENDICOTT,	WILLIAM JACKSON,
HENRY B. RICHARDSON,	EDWARD C. CARTER,	EDMUND F. VAN HOESEN,
WILLIAM H. KENNEDY,	FRANK C. OSBORN.	JAMES L. FRAZIER.

Assistant Secretary, T. J. McMINN.

Standing Committees.

THE PRESIDENT OF THE SOCIETY IS *ex-officio* MEMBER OF ALL COMMITTEES.

<i>On Finance:</i>	<i>On Publications:</i>	<i>On Library:</i>
JOSIAH A. BRIGGS,	JOHN F. O'ROURKE,	HENRY S. HAINES,
G. H. BENZENBERG,	GEORGE H. PEGRAM,	CHARLES C. SCHNEIDER,
GEORGE F. SWAIN,	THOMAS H. JOHNSON,	MORDECAI T. ENDICOTT,
RICHARD S. BUCK,	JOSEPH RAMSEY, JR.,	EMIL KUICHLING,
WILLIAM J. WILGUS.	FRANK C. OSBORN.	CHARLES WARREN HUNT

Special Committees.

ON ANALYSIS OF IRON AND STEEL:—Sub-Committee of the American Society of Civil Engineers (of the International Committee on Standards for the Analysis of Iron and Steel, of which Prof. J. W. Langley is Chairman)—Charles B. Dudley, William Metcalf, Thomas Rodd.

ON UNITS OF MEASUREMENT:—George M. Bond, William M. Black, R. E. McMath, Charles B. Dudley, Alexander C. Humphreys.

ON UNIFORM TESTS OF CEMENT:—George F. Swain, Alfred Noble, George S. Webster, W. B. W. Howe, Louis C. Sabin, S. B. Newberry, Clifford Richardson, Richard L. Humphrey, F. H. Lewis.



The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK.

TELEPHONE NUMBER, - - - - - 533 Columbus,
CABLE ADDRESS, - - - - "Ceas, New York."

AMERICAN SOCIETY OF CIVIL ENGINEERS,

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced
in any of its publications.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

FORTY-NINTH ANNUAL MEETING.*

January 15th, 1902.—The meeting was called to order at 10.25 a. m., President J. James R. Croes in the chair; Charles Warren Hunt, Secretary.

Messrs. John B. Duncklee and G. W. Bramwell were appointed tellers to canvass the ballots for officers for the ensuing year.

The reading of the minutes of the meeting of January 8th was dispensed with.

* A full report of the Forty-ninth Annual Meeting is printed on pages 31 to 69 of this number of *Proceedings*.

The Annual Report of the Board of Direction* and the Annual Reports of the Secretary and of the Treasurer for the year ending December 31st, 1901, were presented, and, on motion, duly seconded, accepted.

The consideration of the following proposed amendment was then taken up:

Amend Article III of the Constitution as follows:

- “ (a) By changing the numeration of the present paragraphs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 & 11 respectively to 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, & 12.
- “ (b) By prefixing a new paragraph, to read as follows, viz., ‘1.—Election to membership in every grade shall be by the Board of Direction and respectively as hereinafter provided.’
- “ (c) By striking out the concluding ten words in the present paragraph 3 newly numbered 4 and substituting in place thereof the following, * * * ‘may then proceed to take action on the applications.’
- “ (d) By inserting in the first line of new paragraph 5, after the first occurrence of the word ‘ballots,’ the words ‘for the election of Corporate Members.’ Also by striking out the word ‘Corporate’ before Member, in the second line and inserting the words ‘of the Board’ after the same. Also by striking out the three concluding lines and substituting therefor, the following, viz., ‘Three or more negative votes shall prevent the election of a candidate. In the case of election the Board shall at once notify the membership. In the case of failure to elect the candidate shall be notified. In either case, all the correspondence pertaining thereto shall be preserved by the Board.’
- “ (e) By striking out all of the present paragraph 5, newly numbered 6, and substituting therefor a new paragraph 6, as follows, viz., ‘6—In case of failure to elect a candidate a new application by the same candidate shall not be accepted or considered until after the expiration of one year from the date of the ballot at which his name was last presented for election.’”

This amendment was proposed by Messrs. Foster Crowell, B. M. Harrod, W. J. Hardee, Henry B. Richardson, John Findley Wallace, Charles L. Strobel and Ralph Modjeski, and was presented for discussion at the Thirty-third Annual Convention, at Niagara Falls, N. Y., June 25th, 1901. It was at that meeting referred to a Committee consisting of seven members, one from each Geographical District, for report to the Forty-ninth Annual Meeting.

The report of the Committee on the advisability of the Proposed Amendment to the Constitution relating to the manner of election of members† was presented by the Secretary.

The amendment was discussed, but was not amended.

* See pages 5 to 18 of *Proceedings* for January, 1902, for the Annual Reports of the Board of Direction, the Secretary and the Treasurer.

† See page 35.

The following resolution was offered by Theodore Cooper, M. Am. Soc. C. E.:

Resolved, That it is the sense of this meeting that the Board of Direction shall have the power to classify applicants before their names appear on any published list of candidates; and, further,

Resolved, That a committee be appointed to report an amendment to the Constitution, which shall embody this idea, and report it at the next Annual Convention, for consideration.

The resolution was adopted.

The following resolution was also offered by Mr. Cooper:

Resolved, That a committee be appointed to report to the next Annual Convention upon raising the standard of qualifications for the several grades of membership.

The resolution was adopted.

It was moved, seconded and carried that the questions embodied in the two foregoing resolutions be referred to the same committee and that that committee, which shall consist of one member from each of the seven geographical districts, be appointed¹ by the President.

The Secretary presented a report of the Committee on Uniform Tests of Cement.*

It was moved by F. W. Skinner, M. Am. Soc. C. E., that the report be accepted, and that the recommended change in the title of the Committee be made.

The motion, being duly seconded, was carried.

The following were appointed members of the Nominating Committee for two years:

JOHN G. VAN HORNE.....	<i>Representing District No. 1.</i>
GEORGE A. KIMBALL.....	" " <i>No. 2.</i>
JOHN F. ALDEN.....	" " <i>No. 3.</i>
SAMUEL TOBIAS WAGNER.....	" " <i>No. 4.</i>
AMBROSE V. POWELL.....	" " <i>No. 5.</i>
JAMES M. JOHNSON.....	" " <i>No. 6.</i>
WILLIAM W. FOLLETT.....	" " <i>No. 7.</i>

The Secretary read a telegram from E. L. Corthell, M. Am. Soc. C. E.†

The Secretary reported that the Board of Direction has awarded the prizes for the year ending with the month of July, 1901, as follows:

The Thomas Fitch Rowland Prize to Paper No. 881, entitled "The Ninety-sixth Street Power Station of the Metropolitan Street Railway Company, of New York City," by L. G. Montony, Assoc. M. Am. Soc. C. E.

The Collingwood Prize for Juniors to Paper No. 883, entitled "A Proposed Method for the Preservation of Timber," by F. A. Kummer, Jun. Am. Soc. C. E.

* See page 50.

† See page 63.

The Secretary reported the result of the ballot on the appointment of the proposed Special Committee on Rail Sections.*

The Secretary read a letter† from John F. Wallace, Past-President Am. Soc. C. E., calling attention to the proposed Isthmian Canal, and proposing that the meeting should formulate an expression of opinion to be directed to Congress.

On motion, duly seconded, it was voted to refer the matter to the Board of Direction, with power.

A motion to memorialize Congress and send a committee to Congress to present reasons why the civil engineering profession at large should be considered in the Bill for the prosecution of work on the proposed Isthmian Canal was offered, discussed, and laid upon the table.

The Secretary read a letter from Roberto Gayol, M. Am. Soc. C. E., inviting the Society to hold its Annual Convention of 1903 in the City of Mexico.

The Secretary presented the report‡ of the tellers appointed to canvass the Ballot for Officers for the ensuing year.

The President announced the election of the following officers:

President, to serve one year:

ROBERT MOORE, St. Louis, Mo.

Vice-Presidents, to serve two years:

CHARLES C. SCHNEIDER, New York City.
JOHN R. FREEMAN, Providence, R. I.

Treasurer, to serve one year:

JOSEPH M. KNAP, New York City.

Directors, to serve three years:

- District No. 1.*—RICHARD S. BUCK, New York City.
District No. 1.—GEORGE H. PEGRAM, New York City.
District No. 1.—WILLIAM J. WILGUS, New York City.
District No. 2.—WILLIAM JACKSON, Boston, Mass.
District No. 3.—EDMUND F. VAN HOESEN, Buffalo, N. Y.
District No. 7.—JAMES L. FRAZIER, San Francisco, Cal.

* See page 55.

† See page 55.

‡ See page 64.

A vote of thanks was passed for the tellers who canvassed the Ballot for Officers.

The following resolution, offered by J. A. Ockerson, M. Am. Soc. C. E., was duly seconded and carried:

"Resolved, That the American Society of Civil Engineers heartily favors the collection of a representative engineering exhibit for the Louisiana Purchase Exposition, to be held in St. Louis in 1903, to illustrate in a creditable way the important part that the engineering profession has taken in the material progress of the country during the past century, and to this end we recommend the earnest co-operation of all members of this and other engineering societies."

The Secretary made announcement of certain features in connection with the programme of the Annual Meeting, and read a letter from George H. Pegram, M. Am. Soc. C. E., inviting the Society to inspect the power-house of the Manhattan Railway Company, at Seventy-fourth Street and East River.

The President called Vice-President C. C. Schneider to the chair.

Adjourned.

February 5th, 1902.—The meeting was called to order at 8.45 p. m. Emil Knichling, Director, in the chair; Charles Warren Hunt, Secretary; and present, also, 96 members and 13 guests.

The minutes of the meeting of January 8th, 1902, were approved as printed in the *Proceedings* for January, 1902. The approval of minutes of the Annual Meeting was deferred until they are printed in the *Proceedings* for February, 1902.

A paper entitled "The Supporting Power of Piles," by Ernest P. Goodrich, Jun. Am. Soc. C. E., was presented by the author.

The Secretary read a communication on the subject by E. Sherman Gould, M. Am. Soc. C. E., and the subject was discussed verbally by H. J. Howe, M. Am. Soc. C. E., and the author.

Ballots were canvassed and the following candidates declared elected:

As Members.

CHARLES FRANCIS CHASE, New Britain, Conn.

ANDREW OSWALD CUNNINGHAM, Cleveland, Ohio.

WILHELM HILDENBRAND, New York City.

JOHN WYKEHAM JACOMB-HOOD, London, England.

WILLIAM PLINY SNOW, Auburndale, Mass.

JOHN MARSHALL GILKISON WATT, Frankfort, Ky.

JULIUS CHRISTIAN WIEST, Managua, Nicaragua.

AS ASSOCIATE MEMBERS.

THOMAS PETTUS BRANCH, Atlanta, Ga.
JAMES BURDEN, Troy, N. Y.
FREDERICK EDWARDS, Schenectady, N. Y.
GEORGE ALEC HARWOOD, New York City.
FREDERIC DE PEYSTER HONE, New York City.
THOMAS FORRESTER MCGILVRAY, Duluth, Minn.
ALEXANDER ORR, Gloversville, N. Y.
EDWARD DANA SABINE, Wakefield, Mass.
WILLIAM AMBROSE DUDLEY SHORT, Lexington, Ky.
CHARLES JOSEPH TILDEN, New York City.
ROBERT SPURR WESTON, Boston, Mass.
PERCY HARTSHORNE WILSON, Camden, N. J.

The Secretary announced the election of the following candidates by the Board of Direction on February 4th, 1902:

AS ASSOCIATES.

WILLIAM ROGERS COPELAND, Philadelphia, Pa.
ALMON HOMER FULLER, Seattle, Wash.

AS JUNIORS.

CLIFFORD GEORGE DUNNELLIS, Pittsburgh, Pa.
MYRON SAMUEL FALK, New York City.
STANLEY ALFRED MILLER, Mobile, Ala.
LUIS GONZAGA MORPHY, Troy, N. Y.
WALTHER RASTER, Chicago, Ill.
CLARENCE WEBSTER RAYNOR, Detroit, Mich.

The Secretary announced the death of the following Members:

MORITZ LASSIG, elected Member April 2d, 1884; died January 13th, 1902.

NATHANIEL EDWARDS RUSSELL, elected Member October 3d, 1888; died January 14th, 1902.

WILLIAM VAN SLOOTEN, elected Member November 3d, 1897; died December 14th, 1901.

Adjourned.

February 19th, 1902.—The meeting was called to order at 8.45 p. m., Nelson P. Lewis, M. Am. Soc. C. E., in the chair; Charles Warren Hunt, Secretary; and present, also, 81 members and 14 guests.

A paper by Walter Loring Webb, Assoc. M. Am. Soc. C. E., entitled "Some Devices for Increasing the Accuracy or Rapidity of Surveying Operations," was presented by title.

Written discussions by Messrs. G. H. Matthes, C. A. Sundstrom, John F. Hayford, Willard D. Lockwood and L. C. Sabin were presented by the Secretary. The subject was discussed verbally by Messrs. Oscar Erlandsen, R. B. Stanton and George A. Taber.

The Secretary announced the death of KENNETH OAKE PLUMMER REINHOLDT elected Junior, February 6th, 1894; Associate Member, October 7th, 1896; died February 6th, 1902.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

January 15th, 1902.—2 p. m.—Vice-President Haines in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Buck, Croes, Freeman, Knap, Kuichling, O'Rourke, Pegram, Schneider, Seaman and Wilgus.

A Finance Committee, a Library Committee, a Committee on Publications, and a Committee on Membership were appointed.

A letter-ballot of the Board was ordered for the election of a Secretary for the ensuing year.

Adjourned.

February 4th, 1902.—8.05 p. m.—Vice-President Schneider in the Chair; Charles Warren Hunt, Secretary, and present, also, Messrs. Briggs, Buck, Croes, Knap, Kuichling, Pegram, Seaman, Swain and Wilgus.

A letter-ballot for the election of a Secretary was canvassed by tellers appointed for the purpose, and Charles Warren Hunt was declared elected.

The resignations of Edmund C. Stout, Assoc. M. Am. Soc. C. E., and Arthur W. Robinson, Jun. Am. Soc. C. E., were accepted.

Progress Reports were received from the various Committees.

Action was taken in regard to members in arrears for dues.

Applications were considered and other routine business transacted.

Two candidates for Associate and six for Junior were elected.*

Adjourned.

* See page 31.

REPORT IN FULL OF THE FORTY-NINTH ANNUAL MEETING, JANUARY 15th and 16th, 1902.

Meeting Called
to Order.

Wednesday, January 15th, 1902.—The meeting was called to order at 10.25 A. M.; President J. James R. Croes in the chair; Charles Warren Hunt, Secretary.

The **PRESIDENT.**—This is the Annual Meeting, and is not one of the meetings in the regular course. The minutes of the meeting of January 8th, 1902, will be printed in the January *Proceedings*, and come up in due course for action at the meeting of February 5th. In view of this fact, the reading of the minutes of this last meeting may be dispensed with at this meeting, and so we will proceed with the regular business.

Tellers
Appointed.

The first thing is the appointment of tellers to canvass the ballots for officers, which ballot will be closed at 12 o'clock, in accordance with the terms of the Constitution. Any members present who have not voted will have an opportunity to vote before that time. At 12 o'clock the ballot will be closed, and I appoint as tellers to canvass the votes Messrs. John B. Duncklee and George W. Bramwell. The tellers can proceed at once with the counting of the ballots that have been received, and any ballots that are received before 12 o'clock will be furnished to them before that time.

Report of the
Board of
Direction.

The first business in order is the report of the Board of Direction for the year 1901.

The Secretary read the report of the Board of Direction.*

The **PRESIDENT.**—The report of Board is received and will be placed on file. The next in order is the report of the Secretary.

The Secretary read his report.†

The **PRESIDENT.**—The report will be placed on file. The next in order is the report of the Treasurer.

The Treasurer read his report.‡

JOSEPH M. KNAP, Treasurer, Am. Soc. C. E.—Gentlemen, I simply wish to emphasize here to the members that, while we are paying off \$5 000 on the bond and mortgage, the Beard has considered that that is enough to pay, although we have made more money than that, considerably, during the past year, and it is good policy, the Board thinks, to let the present generation, so to speak, have the advantage of our profits and our prosperity, and not pay off everything. We might pay off this house debt in a very few years, but I think we can leave that to posterity. What has posterity done for us?

The **PRESIDENT.**—The Treasurer's report will be placed on file. The next business is the proposed amendment to the Constitution.

*See *Proceedings*, Vol. xxviii, p. 5 (January, 1902).

†See *Proceedings*, Vol. xxviii, p. 15 (January, 1902).

‡See *Proceedings*, Vol. xxviii, p. 18 (January, 1902).

- The Secretary read the proposed amendment, as follows:
- “Amend Article III of the Constitution as follows:
- “(a) By changing the numeration of the present paragraphs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11, respectively to 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 & 12.
 - “(b) By prefixing a new paragraph,1...., to read as follows, viz. ‘1.—Election to membership in every grade shall be by the Board of Direction and respectively as hereinafter provided.’
 - “(c) By striking out the concluding ten words in the present paragraph 3 newly numbered 4 and substituting in place thereof the following, * * * ‘may then proceed to take action on the applications.’
 - “(d) By inserting in the first line of new paragraph 5, after the first occurrence of the word ‘ballots,’ the words ‘for the election of Corporate Members.’ Also by striking out the word ‘Corporate’ before Member, in the second line and inserting the words ‘of the Board’ after the same. Also by striking out the three concluding lines and substituting therefor, the following, viz ‘Three or more negative votes shall prevent an election of a candidate. In the case of election the Board shall at once notify the membership. In the case of failure to elect the candidate shall be notified. In either case, all the correspondence pertaining thereto shall be preserved by the Board.’
 - “(e) By striking out all of the present paragraph 5, newly numbered 6, and substituting therefor a new paragraph 6, as follows, viz, ‘6.—In case of failure to elect a candidate, a new application by the same candidate shall not be accepted or considered until after the expiration of one year from the date of the ballot at which his name was last presented for election.’”

The SECRETARY.—I have the report of the Committee which was appointed upon the proposed amendment, which the chairman, Mr. G. S. Greene, Jr., has forwarded to me, and which he has asked me to present to the meeting.

The PRESIDENT.—The report of the Committee appointed at the Annual Convention to consider this proposed amendment to the Constitution will be read:

The report was read by the Secretary as follows:

Report of the Committee on the Advisability of the Proposed Amendment to the Constitution relating to the Manner of Election of Members.

The undersigned, having been appointed by the President of the Society, acting under the instructions of the Business Meeting held at the Annual Convention, June 25th, 1901, as a Committee to report to the Annual Meeting, January 15th, 1902, on “The Advisability of the Proposed Amendment to the Constitution relating to the Manner of Election of Members,” having duly considered the matter, beg leave to report as follows:

The object of the amendment is to put the election of members in the hands of the Board of Direction, and that the other mem-

Proposed
Amendment
to the
Constitution.

Discussion on
Amendment to
Constitution. bers of the Society shall have no vote or power in the selection of members.

The reason for that change in the Constitution appears to be that several persons, after having been passed as proper candidates by the Board of Direction, have been rejected by the vote of the corporate members of the Society, and that, having asked for reconsideration and another vote, a number of them have been admitted to the Society.

Upon looking up the records of the Society, it appears that, in the past ten years, thirty-two candidates have been rejected by vote of the members of the Society and have asked for reconsideration and been voted upon by what is generally known as the "pink ballot." Of these thirty-two, nineteen were elected members of the Society and the other thirteen were defeated.

It does not seem to your committee that the small number—averaging three a year—of these rejections and reconsiderations is of sufficient consequence to make a change in the Constitution involving the disfranchisement of the members. It is, of course, not impossible for the Board of Direction to make an error, and it is possible that in case they should do so it may possibly be corrected by the ballot of the members.

It appears that one cause of the rejection of candidates by the ballot is that of their classification; at present the Board of Direction classifies a man according to his request. If he were classified by the Board of Direction according to its judgment, it seems probable that the number of rejections would be greatly diminished.

Your Committee therefore begs leave to report against the advisability of the proposed amendment, and to recommend that measures be taken to give the Board of Direction power to classify the candidates before sending them to ballot.

G. S. GREENE, Jr.	District No. 1
EDMUND K. TURNER.....	" No. 2
JOHN KENNEDY.....	" No. 3
JOHN T. FANNING.....	" No. 5
BENJAMIN L. CROSBY.....	" No. 6
GEO. H. MENDELL	" No. 7

The SECRETARY.—This report is signed by every member of the Committee except the representative of District No. 4, Mr. Bernard R. Green, who is here.

FOSTER CROWELL, M. Am. Soc. C. E.—I would like to ask the Secretary whether the Committee formulates any amendment to be substituted for the one proposed and to be presented to the Society for ballot?

The SECRETARY.—It has not. I will say that the Chairman of the Committee has spoken to the Secretary about that, but he did not think, as I understood him, that it was possible to make an amendment to the original motion at this time which would be germane to it, under the Constitution. The Constitution says that a proposed amendment may be amended in a manner pertinent to the original resolution. The object of this proposed amendment is to place the

election of all members in the hands of the Board of Direction and take it out of the hands of the Society.

THEODORE COOPER, M. Am. Soc. C. E.—Do I understand that the Board of Direction has no right to classify candidates? Has not the Board a right, if the evidence is before it that a man should belong to a particular class, to put him there and not nominate him, as he asks to be nominated? If a candidate asks admission to this Society as a member, is the Board compelled to recommend him as a member, although it may find him thoroughly competent for a junior grade? I think it belongs to the Board of Direction to decide that, and it seems to me that, where there is any doubt, the Board can better give a junior grade, because the man has his remedy the following year. It does not seem to me that we need any amendment to the Constitution to correct that error. It seems to me that the Board can say, this man is qualified for such and such a grade, and recommend him for that. It seems to me it is a question of judgment for the Board. The Board asks the members to give it opinions in regard to candidates, and that would seem to indicate that the Board has the authority to determine from the evidence presented to it whether a man is competent for this grade or that. It is a matter of judgment for the Board.

Mr. CROWELL.—I was just about to ask to have that section read which covers the authority of the Board in that case.

P. C. RICKETTS, M. Am. Soc. C. E.—Isn't it a very simple matter? That is, all the Board of Direction has to state to the man is this—and it has done it, I think, in times past: We will recommend your passing to ballot if you will accept a lower grade, and if you do not accept the lower grade we will not pass you to ballot, because we do not think you fit to pass to ballot on that grade. That has been done, and it certainly seems to me it can be done again. It seems to me that that covers the case.

The SECRETARY.—I think the evident misunderstanding as to the powers and practice of the Board in the matter of the classification of applicants can easily be cleared up.

The objections to the present system of self-classification by applicants for membership appear to be that every applicant, when considering his eligibility, may be assumed to have a very different point of view from that of many other members of the Society; this being evidenced by the negative votes which are cast on every ballot by members who are not personally acquainted with the applicant. The applicant's point of view as to eligibility may also be said to be very different from that of the Board of Direction.

Very often, the Secretary has to assume the responsibility of returning applications because they do not fulfill the letter of the constitutional requirements, and this has to be done without presenting the matter to the Board, and is usually caused by the applicant's special

Discussion on interpretation of the Constitution. When, however, the application fulfills the letter of the requirements of the Constitution for the grade applied for, the name, record and list of references of each candidate are published in the Blue List, and the applicant is thus advertised as a candidate for that particular grade. Under the present system, this also must be done before the application is brought to the attention of the Board of Direction.

The Board, after having secured at least five endorsements, considers the application together with all other information received concerning it, and either passes the applicant to ballot in the grade for which he applies, or notifies him that he is eligible for a lower grade, and that his name will be passed to ballot in that grade if he consents. It will be seen that the applicant who accepts the classification of the Board is thus placed in a somewhat uncomfortable position in having applied for a grade for which he is not eligible, and, after having been advertised as an applicant for that grade, appears on the ballot list as a candidate for a lower grade.

A member of the Society, when an engineering friend states that he wishes to join, and asks for his support, naturally promises, without making special inquiry as to the grade for which his friend intends to apply, that he will give it. When confronted with the blank form of endorsement adopted by the Board of Direction, he may find it somewhat difficult to answer the queries necessary to an endorsement, and may possibly be placed in the unpleasant position of being forced to recommend the applicant for a lower grade.

It is well known that generally every applicant desires the highest grade for which he thinks he is eligible, and that therefore many members scan the Ballot rather than the Blue List, and send in negative votes based on the briefed career which is printed, instead of furnishing the Board with their opinion as to his eligibility.

Besides this, there have been several exceptions to the general rule. There have been modest applicants, whom the Board would have been glad to class in a higher grade than that for which they applied, but did not have the power to do so.

The relief for this seems to be in arranging that each candidate, instead of fixing his own classification, should apply simply for admission to the Society; that his name, record and list of references should then be published in a Blue List similar to that now used, and containing a request that all members of the Society give the Board the benefit of their knowledge of the applicant. After having received the necessary number of endorsements, and all information possible concerning each candidate, the Board should then consider his application, and determine the grade to which he is eligible, and, after having secured his consent, should issue his name on the ballot list. Errors of classification would be much less likely to occur under this system than

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(continued).

under that now used, and the information concerning candidates as well as endorsements would be much more free, as it would enable each referee to state his opinion as to the proper classification of the gentleman whom he is endorsing, without being forced to endorse or to refuse to endorse for one particular grade.

The reading of the clause of the Constitution has been asked for.

(The Secretary read Article 3, Sections 2 and 3 of the Constitution.)

Mr. CROWELL.—I should like to ask the Secretary if, in his view, it would be possible, under the present Constitution, for the Board to consider the applications before they go out on the Blue List, as a practical matter, and pass upon that question then?

The SECRETARY.—It is possible that that might be done, but the Board has interpreted the Constitution to mean that the application did not come before it for consideration until it has gone out on the Blue List, and there have been some difficult cases, notably as between the grades of Associate Member and Associate. There are some gentlemen who are engaged in college work, for instance, and there has always been a question about their classification. Applications come in, and the Secretary has again and again taken them to the Membership Committee of the Board of Direction, and they have refused to pass upon them, on the ground that if this were done before the application came before the Board for final adjudication, the Board would have already committed itself to the fact that the applicant was eligible to a certain grade, before having received the answers from his endorsers. The Constitution will have to be amended if such an idea goes through, because it states distinctly that applications must be made for Member or Associate Member, Junior, and so on.

B. R. GREEN, M. Am. Soc. C. E.—On that particular point it seems to me that the Board needs the backing of an amendment to the Constitution. A candidate's name being sent out on the Blue List for the grade of Member, being returned to the Board and afterward classified for a lower grade, puts the candidate in a somewhat delicate position. He has already come before the Society as desiring the grade of Member. He thinks he is qualified for that class, and it is a delicate position for him, to be, in a way, turned down publicly. I think that if the Board had the opportunity, and was sustained by the Constitution, to first classify the candidate, with his consent, that that little difficulty would be overcome. It seems to me it is rather an important point.

Mr. COOPER.—Mr. President, it seems to me that this Society has reached that stage of prosperity and standing that we can afford to raise the bars. Let us make the bars higher so that the applicant has got to jump a little higher to get in. I think the whole subject of grading and the requirements for membership in this Society should be revised and made so that we can elevate still higher the standing

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(continued). which the Society claims to hold and does hold. Personally, I think that every man that enters this Society should enter it in a grade below that of Member, and earn his promotion, and not get it through the recommendation of his friends, but enter as an Associate Member or a Junior, and earn his promotion, and come before us again for our ballot. This is rigid and strong, I acknowledge, but it tends to the benefit of our Society, if we take up that matter, and I will move you, sir, that a committee be appointed to consider this subject and present it to the consideration of the Society at its next Convention, or later.

The PRESIDENT.—Is that motion seconded?

H. S. HAINES, Vice-President, Am. Soc. C. E.—I will second the motion, sir, with a view of requesting the gentleman who has just made it to present the matter in his resolution a little more clearly. From what I have heard of the discussion in the meeting, it seems to be the sense of the members present that the general idea that the Board should classify the applicant as to the particular class of membership to which he should be elected or for which he is eligible, prevails in this meeting. I would therefore ask the gentleman if it would not be better, in presenting his resolution, that he should say, that as it is the sense of this meeting that it is desirable that the Board should classify applicants at the time they make their application for membership, that the committee which he proposes should be appointed should prepare an amendment to the Constitution conformable to the views which have prevailed in this meeting, and that they should present their report at the next Annual Convention.

Mr. COOPER.—I have no objection to accepting that amendment. I think, however, the vote of this meeting in favor of the resolution is the sense of the meeting, but I have no objection, sir.

The PRESIDENT.—The motion should be presented in writing, so that we can understand it thoroughly. If the gentleman will present it, it will be entertained. The sense of this meeting has not been obtained on any subject.

MR. CROWELL.—While the Secretary is writing it, I will merely call attention to the matter of procedure. It has been suggested by the gentleman who seconded the motion that the committee should be directed to report at the Annual Convention. That would simply delay the action of the bringing of the amendment before this Society. If the resolution were to direct that the committee present the amendment in the form provided by the Constitution previous to the Convention, then it could be considered by the Convention as an amendment, the Constitution explicitly providing for the way in which all amendments shall be presented.

J. A. OCKERSON, M. Am. Soc. C. E.—I don't know but what this is as good a time as any to say that I have been instructed by the members of the Society in St. Louis to express their disapproval of placing

the election of members in the hands of the Board of Direction; and I was furthermore instructed to say that if the negative vote at the present time is not sufficiently large to control the membership, that it will be desirable to have that made on a percentage basis. I am simply now expressing the views of the St. Louis members at quite a largely attended meeting held a short time before I came here.

E. A. BOND, M. Am. Soc. C. E.—I am very glad to hear the remarks of the gentleman who has just spoken. I am a Republican. I believe in annexation. I am opposed to Imperialism. Hence I think that the election of members of the different grades, either Members or Associate Members, as the case may be, should be by ballot of the whole membership of this Society, and not be placed in the hands of the Board of Direction. I am content that the Board of Direction should decide the grades in which particular members should join, but I think their election should be by a vote of the members of this Society.

Mr. GREEN.—I rose a little while ago, when the report of the Committee on the amendment had been read, to give something of my reasons for declining to sign with my colleagues, and, from what I have heard on the subject, I am rather more disposed to say a word in self-defence. The election of members, as we all must admit, is practically in the hands of the Board now, and always has been. The Board has classified members; it has practically controlled. The issue of the Blue List is to collect all the information to be had about a candidate. It is their business to do so and it is the business of members to inform the Board. I did not like the word "disfranchisement" used in the report. I do not think it applies. The Board is a representative Board, entirely representative of the whole Society. It has been made so with the greatest care in the recent amendments to the Constitution, and the Board, acting for the Society in the election of members, can do it just as well as the members can, and a great deal better—and much more economically. What is a vote sent out by letter for? Simply to find out how many members are going to vote against the candidate. Those who are going to vote in favor do not need to have a ballot sent to them, for the Board has already canvassed the ballot and made up its mind, from all the information it has been able to gain, that the candidate is eligible for election. The Board acts in the capacity of a Committee on Eligibility and a Committee on Acceptability, as we have in certain other organizations, in order to determine, after getting together all the information, whether a candidate is suitable for membership or not. Why do men vote against the candidate? Generally, I think, for some personal reason, or they may desire the opportunity to vote against the candidate in order to gratify some personal feeling, or at least to have the opportunity of expressing their objection secretly. There are sometimes good reasons for that. Of course, you can under-

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(continued).

stand that a member may feel that he must proceed secretly in his negative vote because it may concern some candidate who is socially or otherwise connected with the voter in a delicate way, which makes him hesitate to make known to anybody, even to a single individual, his objection to the candidate. He has plenty of opportunity. The number of cases must be extremely rare where he would not have all the necessary opportunity to present his objection to the Board, or to some member of the Board. He can find somebody, certainly, on the Board to whom, if he did not wish to trust the whole Board, he could present his objections, and we know that the Board never sends out a letter-ballot if any reasonable objection at all has come before it. If a candidate is rejected this year, he may be elected the next. All we want to look out for is that the candidate is not accidentally or mistakenly elected a member of the Society, for after he is once in he cannot be gotten rid of. I do not think that the Society would be disfranchised. Many clubs and societies having a larger membership than this one put the election of their members, for economy and for the best of reasons, into the hands of their Board of Management or some Committee on Admissions, or something of that kind, and avoid not only the labor, but the considerable expense, as occurs particularly in this Society, of the letter-ballot system. If we go to the extent of a pink ballot, there has to be printed and sent out to all members of the Society, first, a Blue List; then a printed vote; then a printed notice of a pink ballot, and finally the pink ballot. I think that the Secretary could give figures as to the expense of that procedure that would seem to make it desirable to save the expense and the time. The question has seemed to me an extremely simple one, as a matter of economy, and the sending out of the ballot to members is only for the purpose of finding out who there may be in the Society to vote against the candidate after the Board of Direction, a representative body of the Society, has, in the most painstaking way, gone over the whole subject to determine the eligibility and desirability of the candidate.

R. B. STANTON, M. Am. Soc. C. E.—I do not know what there is before the house that will allow what I wish to say in regard to this matter, but from Mr. Green's remark I want to express one thing. Undoubtedly, the best interests of this Society, in my opinion, would be served by electing the members by the Board of Direction, provided there was that one item of publicity to their action, at least to the members of the Board of Direction themselves, who were not able to be present at the meeting at which that action was taken.

I have a personal feeling in that regard, from an occurrence that happened when my dearest friend, who afterward became a member of this Society, was turned down by the Board of Direction and refused an opportunity to go to a ballot, simply upon the letters of two gentlemen some 3 000 miles away from New York, and only by acci-

dent, I being at that time a member of the Board of Direction, did I know of the action taken by that Board. When I did learn of it, I requested from the Secretary, as I believed my right, the information as to why this gentleman had been turned down. I was then residing in California, and represented the Seventh District in the Board. When I received that information I prepared a statement which I presented to the Board of Direction, giving the facts in the case, and practically, I am sorry to say, giving the lie to everything that had been stated in the letters that had been sent to the Board. In other words, the information sent was not truthful.

Now, the point is simply this; that that information was sent, just as Mr. Green says. Ballots against members are cast for personal reasons, and I believe that the Board of Direction is the proper body to elect a member, provided it will give, especially to its own members and also to those who have proposed the new candidate, the information on which he is turned down. I think it is a very important point in regard to the action of any body, not in any way impugning the motives of the Board of Direction at that time, because it was pure ignorance on its part.

The gentleman to whom I refer was afterward passed to ballot, and I suppose I haven't the right to say, but he was practically unanimously elected, and a nobler man never existed on the face of the earth,—John Hislop, who was my first assistant for so many years, and who has to his credit the building of the Yukon Railroad, and who was only recently killed in Chicago.

Mr. GREEN.—My friend, Mr. Stanton, has stated an argument, I think, on my side. I was a member of the Board at the same time, I think, to which he refers. I remember his letter, and I remember the effect it had. He was a distant member, unable to come to the Board meeting. This amendment requires that all members of the Board shall vote by letter-ballot and shall be informed of everything that the Board knows. That is, the resident members or the members of the Board who are able to get to the meetings know about the whole subject, and, therefore, the distant member should have as much information in the matter, before the vote is cast, as the local members of the Board. Consequently, there is something in that. The member residing at a distance, away out West, unable to get to the meetings of the Board, is the man that the members in his vicinity can communicate with if they choose. He is the representative of that district on the Board, and whether he ever comes to a meeting or not, he should know as much about what is going on in the Board, in the matter of elections at least, as the local members, because the amendment requires that the election of members shall be by letter-ballot, just as it is now arranged for the whole Society.

Mr. STANTON.—I recognize Mr. Green's explanation, and I would

Discussion on Amendment to Constitution (continued). say that I am not familiar with that amendment which has been drawn up. If that is all, it does not go far enough. I was the one who proposed Mr. Hislop's name for membership in the Society, and if I had not been a member of the Board I would not have gotten that information. It seems to me that there should be such information given at least to the five members to whom he refers. If I had not been a member of the Board at that time I would not have known anything about it, nor ever have had an opportunity to have given the positive information I did on which a very honorable man was elected to the Society.

Mr. GREEN.—There is only one other remark to make on that, that I can think of, and that is the illustration given by Mr. Stanton of the capable member that came into the Society after once being rejected by the Board. He finally got into the Society, and the Society was very glad to have him. It is a safer mistake to make to put off an election to membership a year or so, than it is to elect a member who would not be a desirable member of the Society, by mistake, for, once in the Society, he stays.

W. L. SAUNDERS, M. Am. Soc. C. E.—What is the question before the house?

The PRESIDENT.—A motion has been offered which will now be read, and the Chair will decide whether that motion is in order or not.

The SECRETARY (reading.)—*Resolved*, that the Report of the Committee be received and placed on file; and be it

Resolved, that it is the sense of this meeting that the Board of Direction shall have the power to classify applicants before their names appear on any published list of candidates, and further,

Resolved, that a Committee be appointed to report an amendment to the Constitution which shall embody this idea, and report it to the next Annual Convention for consideration, and that said Committee be also requested to report upon raising the standard of qualifications for the several grades of membership.

The PRESIDENT.—As an expression of the views of this meeting, I think that that resolution will be in order, but it has no effect whatever on the question which is now before the house. The question is on the amendment to the Constitution which was offered, and which has been before the Society. This amendment to the Constitution may be amended in any manner pertinent to the original amendment by a majority vote of the Annual Meeting, and, if so amended, shall be voted upon by letter-ballot in the form as amended by the Annual Meeting. If not so amended, it shall be voted upon by letter-ballot as submitted. If this meeting desires to formulate an amendment to this amendment to the Constitution which is now before the Society, and to adopt such an amendment, they can do so, and that amendment to the Constitution, as amended by this meeting, will go

to ballot. If not so amended, it must go to ballot in the form in which it was presented. An expression of opinion by this meeting has no binding force on anybody. It is merely an expression of opinion, and that is all that this resolution is. If the members present desire to express their opinion as to what the Constitution ought to be, they can do so, but if the amendment to the Constitution which was offered, and which is formally before the Society, is amended by this meeting, it must go to ballot. If it is not so amended, it must go to ballot. An expression of opinion by this meeting on the general subject has no force and cannot go out officially except just as an expression of opinion of this meeting.

MR. COOPER.—I am to blame for the present situation of affairs. I withdraw that resolution temporarily, and now move that it is the sense of this meeting that the amendment to the Constitution be not recommended, which is the subject previously before the meeting, and I now move that the amendment be not adopted.

(The motion was seconded.)

MR. CROWELL.—Before that motion is put I would like to call attention to the fact that the amendment has been presented, as the Chairman has stated, in the regular way, and goes before the Society. An expression of opinion as to whether or not the members should vote for that amendment will be taken, by the membership at large, who are not here, for what it is worth. I do not think, as a matter of policy—and I say this entirely apart from the fact that I was one of the presenters of the amendment—I think, as a matter of policy, that an Annual Meeting should not attempt to control the decision of the members, when the Constitution provides for the decision being rendered as the result of the printed ballot which is sent out to them. An expression here is not significant. It merely means that the majority of the people present at this time are against the amendment. I do not think, myself, that it is worth while, in view of the report and of the discussion which has taken place since, to expect that the amendment will be adopted by the Society, but I think the Society should be allowed to express its own opinion individually in the letter-ballot. Some of the objections which have been raised to the amendment in the report of the Committee seem to me pertinent. Others do not. I do not think the report indicates a full consideration of the objections to the present method. Mr. Green has referred to some of them; but, while I do not propose to criticise the report at all, I do hope that the meeting will allow this amendment to proceed on its way without making an expression of opinion either for or against it.

MR. WHINERY, M. Am. Soc. C. E.—I would like to know whether the Chair decides as to whether this amendment offered is or is not pertinent to the proposed amendment? It seems to me that that is the first thing to get out of the way.

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Constitution
(continued).

The PRESIDENT.—The Chair will give an opinion on that point shortly. Mr. Bogart has the floor.

JOHN BOGART, M. Am. Soc. C. E.—I wish to ask for information as to one point. As I understand the resolution, I am sure it is exactly in accordance with the Constitution, that whether this Annual Meeting takes action one way or the other, whether it amends this proposed amendment or does not, the amendment must go to ballot either in its original form or as amended by this resolution. Now, I wish to add one more question: If this Annual Meeting takes any action, as, for instance, a motion of disapproval or approval of this amendment, would such an action as that go out upon the letter-ballot with the amendment to the Constitution?

MR. COOPER.—It has been ruled heretofore that this was the only deliberative body of this Society that represents our whole Society. Before this matter goes to ballot—it has been discussed here *pro* and *con*, and I think every one of us has previously made up his mind regarding it—I think, therefore, it would be unjust, to our Society and to those members who cannot come here to this meeting, to fail to express our approval or disapproval. It has been considered here, and certainly it would be cowardice on our part if we failed to express the feeling and the conclusion of this body. I therefore call for the motion.

A. L. HYDE, M. Am. Soc. C. E.—It would seem to me that this matter has been placed in the hands of a committee for consideration, and, before proceeding with the matter, it will be well to do something with that report. I therefore move that that report be received and placed on file. That disposes of that. Then the matter can be called up in order.

The PRESIDENT.—The report has been received and placed on file in the regular order of business, sir.

MR. GREEN.—That report is already received?

The PRESIDENT.—Yes, sir; I have just stated that fact. A motion was offered by Mr. Cooper which he will please either reduce to writing or state in words so that the stenographer can take it down.

MR. COOPER.—I move that this Annual Meeting recommend the amendment, and that the recommendation of the Committee be not accepted by this Society.

The PRESIDENT.—Is that the recommendation of the Committee, or the amendment to the amendment to the Constitution?

MR. COOPER.—The amendment.

The PRESIDENT.—Will you please state it accurately, then, what you do mean to say, or put it down in writing?

MR. COOPER.—Perhaps I am in error as to what the Committee did recommend. What I want to do is to keep the election of the mem-

bers as it now stands, in the hands of the members of the Society. That is what I want to do, and that is what I want this meeting to recommend to be done.

The PRESIDENT.—Well, will you state your resolution, then, sir, so that the stenographer can take it down? The resolution must be pertinent to the amendment to the Constitution in some way.

Mr. COOPER.—Will you have the amendment read, sir?

The SECRETARY.—The purport of it is to put the election of all corporate members of the Society, as well as others, in the hands of the Board of Direction.

Mr. COOPER.—That is what I understood, and I move that that recommendation be not accepted—that this meeting recommend that it be not accepted or voted upon.

Mr. CROWELL.—We have heard some objections raised here in respect to imperialism. Why is the letter-ballot provided—

The PRESIDENT.—I beg your pardon. There is a motion now before the house. If you will make your remarks more germane to that motion only—

Mr. CROWELL.—I am speaking to that question only. Is it not a question of imperialism by this meeting to attempt to decide a matter for the Society at large? I ask why do we have the letter-ballot? It is simply to give an opportunity for the absent member to express his wishes. It may be pertinent for this meeting to pass such a resolution as a parliamentary proposition, but I think it is impertinent for it to do so for the membership at large.

Mr. COOPER.—I move that it is the sense of this meeting that the amendment proposed should not be passed.

The PRESIDENT.—Is that motion seconded?

The motion being duly seconded, was put by the Chair and carried.

The PRESIDENT.—The question now before the house is: Shall the amendment to the Constitution be amended before being sent out to ballot? I may state, with regard to that, that the proceedings of this meeting will be published and sent to all the members before the ballot can be issued, and that the ballot is counted at the first regular meeting in March. The proceedings of this meeting will go out to the Society before that amendment is voted upon, but the amendment as presented or as amended by this meeting must be voted upon on the first Wednesday in March. Are there any amendments offered to the amendment to the Constitution to be appended to it or to be incorporated in it, rather, and sent out to ballot? Are there any amendments? Is there any further discussion of the question? The Chair not hearing that any discussion of the question is asked for, and no amendments to the amendment to the Constitution having been offered by this meeting, the amendment offered and presented at the

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to Constitution
(continued). Convention will be sent out to ballot in its form as presented, to be voted upon on the first Wednesday in March.

The next order of business—

Mr. COOPER.—I now call up the resolution which I withdrew.

The SECRETARY.—(Reading) *Resolved*, that it is the sense of this meeting that the Board of Direction shall have the power to classify applicants before their names appear on any published list of candidates; and, further,

Resolved, That a Committee be appointed to report an amendment to the Constitution, which shall embody this idea and report it to the next Annual Convention for consideration, and that said Committee be also requested to report upon raising the standard of qualifications for the several grades of membership.

C. G. DARRACH, M. Am. Soc. C. E.—I second the resolutions.

Mr. OCKERSON.—Would it not be well to divide that question? Some members might wish to vote in favor of all except the last clause.

Mr. COOPER.—That is perfectly proper. I move that it be divided into two resolutions.

The PRESIDENT.—The resolution, with the consent of the proposer of the resolution, will be divided into two resolutions. The first resolution is—

The SECRETARY.—(Reading) *Resolved*, that it is the sense of this meeting that the Board of Direction shall have the power to classify applicants before their names appear on any published list of candidates; and, further,

Resolved, that a Committee be appointed to report an amendment to the Constitution, which shall embody this idea, and report it at the next Annual Convention for consideration.

Mr. CROWELL.—I have already raised the point that if this Committee reports to the Annual Convention, it does not bring the amendment before this Society. It may be desirable to spend another year on it, but if this motion prevails, that Committee will report at the Annual Convention, but the amendment cannot come before the Society until the next Annual Meeting, a year from now. If that is the object, why, well and good, but otherwise the motion should read instructing that Committee to present an amendment to the Society in season for its consideration at the Annual Convention.

Mr. COOPER.—That is not my intention, Mr. Chairman. My intention is to bring this matter before the Convention, that represents our Society, for discussion. I am not endeavoring to push anything through this Society without the fair consideration of the members, and action being taken after a fair consideration. The first meeting that follows this, which fully represents the whole Society, is the Annual Convention. It is not a matter of such hurry as to go through

in one year, or whether it takes two years or five years, but I think it is a matter that the members should take up and consider—whether we are not now in such a state of prosperity and standing that we can afford to elevate the standard of our membership.

The PRESIDENT.—If there is no objection to the presentation of this resolution at this time—it may be that it will be rendered nugatory by the action of the Society on the first Wednesday in March—but that has nothing to do with it. The question now is upon the adoption of this resolution offered by Mr. Cooper.

The resolution being put to vote was unanimously carried.

The SECRETARY.—The second part of that motion, with the change that will be necessary, is:

Resolved. That a Committee be appointed to report to the next Annual Convention upon raising the standard of qualifications for the several grades of membership.

Mr. HAINES.—I second the motion, and if the meeting will permit me to occupy its time for a moment or two, I wish to say that I hope that this measure will prevail. Never mind whether it should be thought advisable that there should be any change in the standards of qualifications for membership in this Society, but the passage of this resolution will give that Committee an opportunity to consider this whole matter, and, as Mr. Cooper very properly said, to have it brought up for discussion at the next meeting at which the membership is fully represented. I do hope, therefore, that whatever may be your personal views, gentlemen, as to the advisability of making a change in the qualifications, that you will sustain this resolution to have this matter left to the Committee to report upon at the next Convention.

The PRESIDENT.—Gentlemen, it is now five minutes to twelve; the ballot will close at 12. Any members who have not voted for officers of the Society will have an opportunity to do so during the next five minutes, and no later, because the ballot will close at 12 o'clock.

The question is now on the adoption of Mr. Cooper's resolution.

The motion being put was carried.

The SECRETARY.—I would like to call attention to the fact that there is no provision in either of those resolutions as to how those committees shall be appointed or of how many members they shall consist, and I think it will be well for this meeting to fix that.

The PRESIDENT.—Will Mr. Cooper make the suggestion?

Mr. COOPER.—I think such matters are usually done by the Board of Direction, or by the Chair, are they not?

The SECRETARY.—The President had better do that, because the Board does not meet very often.

Mr. COOPER.—I would suggest that they be appointed by the Chair, sir.

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Constitution
(continued).

The PRESIDENT.—And how many?

Mr. OCKERSON.—As far as I am concerned I think it would be preferable to follow the custom to appoint one from each district, on important matters of that kind.

The PRESIDENT.—Will you make a motion that they be appointed one from each of the districts, on each of these Committees?

Mr. OCKERSON.—I will.

The motion was duly seconded.

Mr. CROWELL.—Could not both those questions be referred to the same Committee, under the resolutions?

The PRESIDENT.—Well, there are two separate resolutions now.

Mr. COOPER.—It is, of course, in the power of the Chairman to appoint the same Committee.

Mr. HAINES.—I move that they be referred to the same Committee.

The motion, being duly seconded, was put to vote and carried.

The PRESIDENT.—It is now 12 o'clock, and the ballot is closed. The next thing in order is the report of the Cement Committee.

The SECRETARY.—I have been requested to present the following report:

JANUARY 15TH, 1902.

Committee
on Tests of
Cement.
TO THE PRESIDENT AND MEMBERS,
AMERICAN SOCIETY OF CIVIL ENGINEERS.

GENTLEMEN: The Committee on the Proper Manipulation of Tests of Cement desires to present the following report:

By authority granted at the last Annual Meeting of the Society the membership of the Committee has been increased to nine, by the addition of Messrs. S. B. Newberry, Clifford Richardson, Richard L. Humphrey and F. H. Lewis.

Three meetings of the Committee have been held, at which the work has been mapped out, and it is now well under way.

The Committee has considered and decided a number of details in connection with its final report. Much time has been devoted to a consideration of the advisability of substituting a natural sand for the standard quartz; and a series of tests has been undertaken with a view of determining the adaptability of the various natural sands for this purpose. The questions: Accelerated tests for constancy of volume, sieves and method of sieving, and normal consistency, have also been fully discussed.

At the last meeting of the Committee, in Philadelphia, its Secretary was instructed to prepare a preliminary report, embodying the reports of its members on the special subjects, to serve as a basis for the preparation of its final report.

It is the intention of the Committee to present a report at the next Annual Meeting of the Society, though some points must necessarily be left open even at that time.

The Committee was created by the Society to report on the proper manipulation of tests of cement. This limitation of its powers has proved a serious handicap. The Committee feels that it should be unrestricted and should have full power to act on all matters pertaining to its work. It desires to report, in connection with its recommendations, the data on which these recommendations were based. This it would be unable to do under its present powers.

The Committee would, therefore, submit for your consideration the desirability of increasing its powers, and would recommend that the title under which the Committee was created be changed to "The Committee on Uniform Tests of Cement."

For the Committee,

G. S. WEBSTER,

Acting Chairman.

RICHARD L. HUMPHREY,

Secretary.

F. W. SKINNER, M. Am. Soc. C. E.—I move that the report be accepted, and that the recommended change of title be also made.

The motion, being duly seconded, was put to vote and carried.

The PRESIDENT.—The next in order is the election of the Nominating Committee.

The SECRETARY.—Mr. President, the usual circular was mailed some time ago asking each member of the Society to indicate his choice of a member to represent his section on the Nominating Committee, and the following is the result:

Nominating Committee.

District No. 1.—Total number of votes received, 60; distributed as follows:

JOHN G. VAN HORNE.....	9
GEORGE W. TILSON	4
RICHARD S. BUCK*.....	3
EDWARD P. NORTH.....	3
H. W. BRINCKERHOFF.....	2
GEORGE W. CATT.....	2
ALLEN HAZEN.....	2
GEORGE A. JUST.....	2
CHARLES MACDONALD.....	2
CHARLES H. MYERS.....	2
GEORGE S. RICE.....	2

The following received one vote each:

JOSIAH A. BRIGGS,*	JOSEPH MAYER,
ALFRED P. BOLLER,	HENRY P. MORRISON,
WILLIAM HENRY BALDWIN,	GEORGE S. MORISON,
JOHN C. BRACKENRIDGE,	GEORGE W. McNULTY,
ALBERT CARR,	O. F. NICHOLS,
THEODORE COOPER,	JOHN F. O'ROURKE,*
HOWARD J. COLE,	H. B. SEAMAN,*
JOHN VIPOND DAVIES,	IRA A. SHALEY*
JOSEPH P. DAVIS,	J. WALDO SMITH,
S. L. F. DEYO,	EDGAR B. VAN WINKLE,
GEORGE W. FULLER,	ROBERT VAN BUREN,
PHILIP W. HENRY,	CHARLES DOD WARD,
RUDOLPH HERING,	F. STUART WILLIAMSON,

S. C. WEISKOPF.

The SECRETARY.—It has been the custom to take up these matters by districts in order to deal with them as we go through. There is a report for each district.

* Ineligible.

Nominating Committee
(continued).

The PRESIDENT.—You have heard the vote which has been cast for a member of the Nominating Committee for the First District.

Mr. CROWELL.—I move the gentleman named having the highest number of votes, John G. Van Horne, be the representative of the First District.

The motion, being duly seconded, was put to a vote and carried.

District No. 2.—Total number of votes received, 37; distributed as follows:

JOHN P. SNOW.....	7
GEORGE A. KIMBALL.....	7
F. P. STEARNS.....	3
J. R. WORCESTER.....	3
A. S. CHEEVER.....	2
E. P. DAWLEY.....	2
GEORGE B. FRANCIS.....	2

The following received one vote each:

C. FRANK ALLEN,	RICHARD A. HALE,
H. BISSELL,	HENRY MANLEY,
JOSEPH P. COTTON,	JAMES W. ROLLINS, JR.,
JOHN W. ELLIS,	J. HERBERT SHEDD,
JOHN R. FREEMAN,*	GEORGE F. SWAIN,*

GARDNER S. WILLIAMS.

A MEMBER.—I move that George A. Kimball be appointed.

The motion, being duly seconded, was put to vote and carried.

District No. 3.—Total number of votes received, 22; distributed as follows:

JOHN F. ALDEN.....	4
ELNATHAN SWEET.....	2
WILLIAM A. HAVEN.....	2
LOUIS H. KNAPP.....	2

The following received one vote each:

GEORGE B. BASSETT,	P. ALEXANDER PETERSON,
ROBERT CARTWRIGHT,	CHARLES M. MORSE,
EDWARD B. GUTHRIE,	JOHN C. QUINTUS,
EDMUND HAYES,	THOMAS W. SYMONS,
WILLIAM T. JENNINGS,	CHARLES H. TUTTON,
W. B. LANDRETH,	E. F. VAN HOESEN *

Mr. RICKETTS.—I move that Mr. John F. Alden be nominated.

The motion, being duly seconded, was put to vote and carried.

District No. 4.—Total number of votes received, 62; distributed as follows:

SAMUEL TOBIAS WAGNER.....	15
JAMES L. LUSK.....	7
GEORGE S. WERSTER.....	6
RICHARD KHUEN, JR.....	4
GEORGE S. DAVISON.....	3
CHARLES B. BALL.....	2
H. M. WILSON.....	2
W. G. WILKINS	2

* Ineligible.

The following received one vote each:

JOHN A. ATWOOD,	WILLIAM T. MANNING,
J. C. BLAND,	MANSFIELD MERRIMAN,
CHARLES DAVIS,	WILLIAM ARTHUR PRATT,
ARTHUR P. DAVIS,	S. M. PREVOST,
J. E. GREINER,	THOMAS RODD,
C. W. HAINES,	L. Y. SCHERMERHORN,
LEWIS M. HAUPT,	E. G. SPILSBURY,
JOHN W. HILL,	EMIL SWENSSON,
C. B. HUNT,	EDWARD B. TAYLOR,
WASHINGTON JONES,	THEODORE VOORHEES,
PAUL L. WÖLFEL.	

G. S. WEBSTER, M. Am. Soc. C. E.—I move that Samuel Tobias Wagner, having the largest number of votes, be elected a member from that district.

The motion, being duly seconded, was put to vote and carried.

District No. 5.—Total number of votes received, 68; distributed as follows:

AMBROSE V. POWELL.....	11
CLIFFORD BUXTON.....	4
ONWARD BATES.....	4
CHARLES E. GREENE.....	4
AUGUSTUS MORDECAI.....	3
E. C. CARTEL*.....	2
C. W. KITTREDGE.....	2
ALFRED NOBLE.....	2
H. E. RIGGS.....	2
JOB TUTHILL.....	2
SAMUEL T. WELLMAN.....	2
GEORGE Y. WISNER.....	2

The following received one vote each:

GEORGE H. BENZENBERG,*	M. W. KINGSLEY,
W. H. BIXBY,	THOMAS H. JOHNSON,*
JAMES H. BRACE,	G. A. MARR,
DANIEL BONTECOU,	FRANK C. OSBORN*,
L. F. G. BOUSCAREN,	H. W. PARKHURST,
D. D. CAROTHERS,	W. D. PENCE,
L. E. COOLEY,	GEORGE S. PIERSON.
JAMES DUN,	WALTER P. RICE,
JOHN T. FANNING,	JAMES RITCHIE,
S. M. FELTON,	WILLIAM H. SEARLES,
EDWARD FLAD,	W. A. THOMPSON,
JULIAN GRIGGS,	EBEN S. WHEELER,
E. A. HANDY,	L. L. WHEELER,
WILLIAM H. HUGHES,	AUGUST ZIESING.

R. W. HUNT, M. Am. Soc. C. E.—As from the district, I move that Mr. Ambrose V. Powell be selected.

The motion, being duly seconded, was put to vote and carried.

* Ineligible.

Nominating Committee
(continued).

District No. 6.—Total number of votes received, 51; distributed as follows:

JAMES M. JOHNSON.....	11
A. H. BLAISDELL.....	7
ARSÈNE PERRILLIAT.....	5
HUNTER McDONALD.....	3
AUTHOR HIDER.....	2
ADDISON M. SCOTT.....	2

The following received one vote each:

JAMES P. ALLEN,	J. L. LUDLOW,
J. B. ATKINSON,	LOUIS R. McLAIN,
W. M. BLACK,	F. A. MOLITOR,
WILLIAM W. CARSON,	R. MONTFORT,
E. J. CHIBAS,	HENRY B. RICHARDSON,
CHARLES I. CHURCHILL,	MILLER A. SMITH,
WILLIAM P. CRAIGHILL,	B. F. THOMAS,
BENJAMIN L. CROSBY,	A. J. TULLOCK,
GEORGE G. EARLE,	J. A. L. WADDELL,
J. F. HINCKLEY,	R. L. VAN SANT,
ANY MEMBER.	

C. B. STEWART, Assoc. M. Am. Soc. C. E.—I move that Mr. James M. Johnson be elected as the member.

The motion, being duly seconded, was put to vote and carried.

District No. 7.—Total number of votes received, 25; distributed as follows:

W. W. FOLLETT.....	2
C. D. MARX	2
A. RIFFLE.....	2

The following received one vote each:

A. L. ADAMS,	JOHN D. ISAACS,
EUGENE CARROLL,	LORENZO M. JOHNSON,
E. B. CUSHING,	LEWIS KINGMAN,
C. E. L. B. DAVIS,	W. H. LEFFINGWELL,
W. A. DRAKE,	FRANKLIN RIFFLE,
JAMES L. FRAZIER,*	ANDREW ROSEWATER,
C. E. GRUNSKY.	D. W. ROSS,
J. HERRON,	JAMES D. SCHUYLER,
J. M. HOWE,	E. STENGER,
E. T. WRIGHT.	

MR. CROWELL.—I move that Mr. William W. Follett be appointed.

The motion being duly seconded was put to vote and carried.

THE SECRETARY.—The Secretary has received the following cable-gram:

Cablegram
from
E. L. Corthell.

“ CHARLES WARREN HUNT,
“ 220 West 57th Street, New York City.
“ My kindest regards and best wishes to all my friends for a pleasant re-union.

“ BUENOS AYRES, January 14th, 1902.

“ E. L. CORTHELL.”

* Ineligible.

The PRESIDENT.—There is no action to be taken on that; the best wishes are reciprocated, undoubtedly.

The SECRETARY.—I have to report the following action by the Board of Direction.

In accordance with the rules adopted for the purpose, the Board of Direction has made the following awards of prizes for the year ending with the month of July, 1901.

Award of
Prizes.

The Thomas Fitch Rowland Prize to Paper No. 881, entitled "The Ninety-sixth Street Power Station of the Metropolitan Street Railway Company, of New York City," by L. G. Moutony, Assoc. M. Am. Soc. C. E.

The Collingwood Prize for Juniors to Paper No. 883, entitled "A Proposed Method for the Preservation of Timber," by F. A. Kummer, Jun. Am. Soc. C. E.

The Board has further decided that no award of the Norman Medal be made for the year ending with the month of July, 1901.

As that is merely a report, no action is necessary.

I also have to report that the ballot on the appointment of the Special Committee on Rail Sections resulted as follows:

Ballot on Com-
mittee on Rail
Sections.

Total ballots received.....	1 098
Without signature.....	14
Not entitled to vote.....	10
Otherwise defective.....	18
	—
	42
Total votes counted.....	1 056
	—
Voted yes.....	1 014
" No.....	42
	—
	1 056

Inasmuch as the Corporate Membership on January 7th, 1902, was 2 122, the vote complies with the Constitutional provision, and the Committee will be appointed by the Board.

The following letter has been received from John F. Wallace, Past-President of the Society:

CHICAGO, January 10th, 1902.

MR. CHARLES WARREN HUNT,

Sec'y., American Society of Civil Engineers,

220 West Fifty-seventh Street, New York.

Employment
of
Engineers
on Isthmian
Canal.

MY DEAR SIR,—I understand the House bill for the construction of the Nicaragua Canal practically provides that this work shall be carried on under the supervision of the Secretary of War. This, of course, means under the direction of the Army Engineers.

It would seem that the large body of civil engineers in the United States should have proper representation on the staff selected to design and construct what will probably prove to be the most important engineering project of the 20th century.

Employment
of Engineers
on Isthmian
Canal
(continued).

It would seem proper that the American Society of Civil Engineers should take some action at its Annual Meeting to see that this important matter receives careful and proper consideration.

First, as to the wisdom of action in this direction; second, as to the method to be used to secure the results.

Personally, I am in favor of action by the Society at its coming Annual Meeting. Such action, it seems to me, should consist in the presentation of a formal resolution or memorial to both Houses of Congress. Whatever action is taken, if any, should be at the Annual Meeting.

If I am unable to attend the Annual Meeting personally, you are at liberty to present this letter to the Society.

Very truly yours,

JOHN F. WALLACE.

The PRESIDENT.—It is proposed by Mr. Wallace that this meeting should formulate an expression of opinion to be directed to Congress.

JAMES OWEN, M. Am. Soc. C. E.—I move that it be referred to the Board of Direction, with power.

Mr. CROWELL.—I second the motion.

The PRESIDENT.—It is moved and seconded that the plan of presentation to Congress of a memorial be referred to the Board of Direction, with power.

Mr. HAINES.—Will you pardon me if I say a few words on this subject. Of course, I am not personally interested in this work, but it does seem to me that if this Society has ever had a subject before it in which the professional interests of its members were more deeply involved, it has not been in the number of years that I have been a member, and I do hope that those who are more directly interested in it than I am will not permit this matter to go off in this perfunctory way.

I quite agree with every word that our Past-President has said, that there should be some effort made to have the profession of civil engineering properly represented in the construction of this great engineering work, and I do not see how the body of civil engineers as a whole can more thoroughly have its influence felt in the deliberations on this matter in Congress than through this, the properly constituted organ, for them to give expression to their opinions and their wishes; and I do hope that it will be brought up in such a way that if it is determined that it shall be presented to Congress that it shall be done officially, and that the Board, if it is left to them, should have power to act and power to pay for the expenses of a committee to present this thing properly before Congress. I know from past experience in other matters that it is much more efficient to have a committee personally present than to undertake to impress your views upon the minds of members of Congress through a printed memorial.

The PRESIDENT.—The question is referred by this resolution to the

Board of Direction, and the Vice-President will have an opportunity to express his views there.

Mr. HAINES.—Pardon me; I am not speaking as an official; I am speaking as a member of the great profession of civil engineers, not personally interested in this matter at all; but this, as I understand it, goes to the Board without any expression of opinion on the part of this meeting.

The PRESIDENT.—Do you wish an opinion expressed?

Mr. HAINES.—It is for the gentlemen who are more interested in the matter than I am to determine that.

The PRESIDENT.—If it is the desire that this meeting should express an opinion, it is very easily done; it can be done in two minutes.

Mr. CROWELL.—For the purpose of bringing it before the meeting, I move that the Board of Direction—I would add to this motion—a motion was made to refer to the Board of Direction and we are talking to that.

The PRESIDENT.—Let that pass; then you can if you wish say that it is the wish or the opinion of this meeting.

Mr. CROWELL.—Very well.

The PRESIDENT.—The motion is on the reference to the Board of Direction.

The motion, being duly seconded, was put to vote and carried.

Mr. CROWELL.—I move you, sir, that it is the sense of this meeting that it is desirable in the interest of the Society that the Board of Direction should memorialize Congress and send a committee to Congress to present the reasons why this Society and the membership it represents should be considered in the bill for the prosecution of any public work of the character of the proposed Isthmian Canal.

The PRESIDENT.—The chair thinks that that is an expression of instructions to the Board of Direction on a matter that has been referred to it, and is not in order. The only motion that can be made is the expression of an opinion by this meeting as to the desirability of the profession of civil engineering being represented in the management of the work in question. I think that it is not exactly courteous or proper for the Society at this meeting to instruct the Board of Direction as to matters that have been referred to it for consideration and action, and I cannot entertain that motion; but if it is a motion of an expression of opinion of this meeting, I will be glad to entertain it.

Mr. CROWELL.—The object of making the suggestion was merely to indicate what, in the sense of this meeting, was the shape that the action of the Board should take.

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of Engineers
on Isthmian
Canal
(continued).

The PRESIDENT.—The sense of this meeting on the general subject?

Mr. CROWELL.—I think if that motion is read it will be found not to contain any offensive assumption, and as the meeting has been considered as the proper exponent of the views of the Society to control the individual action of its members, I do not see why we should not express our wishes to the Board.

E. P. NORTH, M. Am. Soc. C. E.—With a great deal of respect for you, personally, and for your office, Mr. President, I wish to take exception, directly, to your assertion that this meeting cannot instruct the Board of Direction.

The PRESIDENT.—I made no such ruling, sir.

Mr. NORTH.—I understood you to say so.

The PRESIDENT.—I said it was discourteous to the Board of Direction.

Mr. CROWELL.—I understood the Chairman to say that he would not entertain the motion. I think the wording will show that there is no courtesy.

The PRESIDENT.—A motion of instruction to the Board of Direction as to how they are to act on a matter which is referred to them for consideration and action, I do not think is courteous or proper, and I rule that I will not receive such a motion or entertain it.

Mr. CROWELL.—I should like to have the resolution read.

Mr. NORTH.—I may be under a misapprehension, but I understood the motion to refer it to the Board of Direction was put through without any amendment to it. It was then, it seems to me, open to amendment. Now, I think that if it is not courteous to instruct the Board of Direction, we had better take that first motion back and reconsider it and embody in that the opinion of this meeting, which I think is always superior to the Board of Direction, creating the Board of Direction, as it does.

(The stenographer read the resolution.)

Mr. CROWELL.—I do not see how any expression of courtesy is involved in that wording, and, if the Chair adheres to the opinion expressed, I appeal from the decision of the Chair.

The PRESIDENT.—The motion as read is different from what I understood it to be. The motion is that it is the opinion of this meeting that the Board of Direction ought to memorialize Congress.

Mr. OCKERSON.—I desire to endorse fully the statement made by Mr. Wallace, and also the statements made by Mr. Haines.

If the civil engineers do not look out for their own interests no one else will, and it seems to me that it is very important that they should be represented on any commission that is organized for the construction of an Isthmian Canal, and I am in favor of taking such action as may be necessary to call the attention of Congress to this phase of the matter.

The PRESIDENT.—I think that the matter can be simplified by omitting the Board of Direction from this resolution that has been offered, and make it simply an expression of opinion by the meeting, and I will be very glad if Mr. Crowell will withdraw the Board of Direction from his resolution.

Mr. CROWELL.—I am not prepared to do that. I think the Board of Direction is the body to look after this matter and see to its being carried out. I call for a vote on my motion.

Mr. GREEN.—May I suggest an amendment to this resolution by the omission of the words which make it general as to all great public works, and confine it to the Isthmian Canal for the present? It will be difficult to draw the line between small works and great works, and might embarrass the thing before Congress.

Mr. CROWELL.—I accept that. Cross out "any public works," and just make it refer explicitly to the Isthmian Canal.

M. R. SHERRELD, M. Am. Soc. C. E.—Can we, in any bill before Congress, mention the name of the Society? This would seem to indicate that we proposed to mention the name. I understand the motion intended that the Board of Direction should ask Congress to include, in any proposed bill, this Society—the membership of this Society.

Mr. WHINERY.—This motion is one which, if adopted, would mark a distinct departure from the long-established policy of the American Society of Civil Engineers. When it comes to the merits of the question as to whether the American Society of Civil Engineers and its members should be represented in the management of this, or any other great public work, no member of this Society shall go further than I in asserting that right, and that it is with entire propriety that the American Society of Civil Engineers and its members should be fully represented in every work of this kind, but, gentlemen, this involves more than that. It involves a step in a different direction from what the Society has ever taken heretofore. We have, up to this time, excluded from the policy of this Society everything savoring of commercialism, of business, and I do not think that such a measure should be taken now without very careful consideration. I do not believe that, on mature consideration, we would care to have the Society pose before Congress, or before the world, as seeking or demanding positions for its members, because, in the end, that is what it amounts to.

It is not this question directly that is before the Society, as I understand it, now. It is this broad general principle, shall this Society become an employment agency for the benefit of its members? I do not think the Society can afford to take such a position. I think we should, individually, make every proper effort to have this Society represented in all the great public works of the country, and par-

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(continued).

ticularly in this one, but, personally, I am bound to oppose any official action in that direction by the Society as a body. (Applause.)

H. G. PROUT, M. Am. Soc. C. E.—I had intended to say what Mr. Whinney has said so much better than I could possibly say it. I thoroughly agree with the position that Mr. Whinney has taken. If we should send a committee to Congress it would be misunderstood. We could send that committee there with a full sense of the dignity of our position, the position of this Society, and the position of this profession, and Congress would not receive it in any such sense at all. They would receive that committee just as they receive everybody else who goes down to Washington asking for something. I think it would be most undignified and most unfortunate for this Society to send a committee to Congress to interfere in this matter at all.

As the thing stands, it is this way: The Hepburn Bill, the House Bill, puts the matter in the hands of the Secretary of War; the Morgan Bill, the Senate Bill, provides for a commission. I do not remember whether the Secretary of War is included in that commission *ex officio* or not, but I think not. It provides for the appointment of a commission which would be an experienced commission and which would make the conduct of this enterprise very largely a civil matter. I should say that the chances are that neither one of these bills will ever become a law. As it stands now, there is a most excellent chance that the Hepburn Bill will be very considerably modified, and the probability is that arrangements will be made so that the outcome will be such that this matter will be put in the hands of a civil commission; but, however that may be, that has nothing to do with the principle Mr. Whinney has so excellently expressed, and in which I so thoroughly agree. Therefore, I shall vote against this resolution.

Mr. OCKERSON.—I wish to express my position in that matter. I agree pretty largely with what these gentlemen have said. The position I wish to take is this: I do not think the civil engineer should be excluded by law from any field of engineering. That is as far as I care to go. I do not care to advocate the employment of the members of this Society, but, for the great body of civil engineers, I do not want to see laws framed that will exclude them from any field of work.

Mr. CROWELL.—As the author of the motion I wish to say that neither my friend, Mr. Whinney, nor my friend, Col. Prout, can go a step beyond me in the conservative desire to keep this Society from taking such a position before the world—before the population of our country. But I think this a different question altogether. It is true that in the past this Society has abstained from any attempt to push itself forward in the sordid way of getting employment for its members, but this is the first occasion when this country has undertaken to do work outside of the country, of this nature. It seems to

me eminently proper and advisable that at this juncture every effort should be made to have Congress and the people recognize the very principle which Mr. Whinery and Col. Prout have enunciated. It seems to me that to have a committee properly appointed, which could go down there and confer with the committee in charge of a bill, and represent to them the reasons why civil engineers should be considered, is not commercialism. I think it is a duty to our fellow countrymen that the country should have the advantage of having the participation of civil engineers. I think that while Mr. Whinery and Col. Prout have expressed themselves conservatively, they are yet taking a narrow stand on this question, and I hope the motion will prevail. It is not for a committee to go down advocating the employment of any individual or any number of individuals from the Society; they may not even require or request that a bill should call for such employment, but certainly the Society and what it represents should be represented in the conduct of work of that character. I hope the motion will prevail.

L. L. TRIBUS, M. Am. Soc. C. E.—I look upon the thing in somewhat the same way that two or three of the previous speakers have. If the members of the engineering profession of this country have not impressed upon the citizens of this country the need of their services in such matters as this, we do not deserve recognition, and I believe that Congress, if they pass such bills, appointing a commission, if the services of civil engineers are needed they will undoubtedly be called for. I think it would be very undignified for us to go and attempt to get this work. That is precisely what it means.

The PRESIDENT.—A number of military engineers, who are also members of this Society are present; we might hear from them.

Mr. SHERRED.—When I spoke before on this subject, I did not make myself very clear. What I think would cover the point would be to substitute in this resolution for the words "this Society," the words "civil engineering profession." I do not think we want to take the position of relegating all the honors of the profession to ourselves, but the action coming from the American Society will reflect on the Society and will show that this Society stands up for the profession and wants to look out for the honors. That is the point.

Mr. CROWELL.—I am perfectly willing to accept that change, substituting the name of the civil engineering profession in the place of the name of this Society; that is in accordance with the spirit of the resolution.

Mr. GREEN.—If the seconder of my proposed amendment will permit, I should like to include this proposed amendment and couple with it one to change the language so as to read as follows:

"It is the sense of this meeting that it is desirable in the interests of the Society that the Board of Direction should memorialize Congress

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(continued).

and send a committee to Congress to present the reasons why the civil engineering profession at large should be considered in the Bill for the prosecution of work on the proposed Isthmian Canal."

Mr. CROWELL.—It has been suggested to me that a further amendment of the language would be desirable, and, as I am very desirous of pleasing everybody, I will state what the suggestion is: That instead of expressing that as the sense of this meeting, to say that it is to the interests of the Society—while that is only an instruction to the Board of Direction, the suggestion that it should be the interests of this country, which is the more dignified plane to stand upon, and so, in my capacity of general agreeer, I will accept that amendment—anything to get this matter before the Board.

J. F. O'ROURKE, M. Am. Soc. C. E.—There seems to be a tendency to ignore the fact that all the work that has been done heretofore on this Isthmian Canal and on the canal question generally has been put in the hands of civil engineers, and it is to their great credit, I think, that nearly all of them are members of this Society. I think when you are trying to generalize at all, in order to generalize best you had better put the Society in, because there is hardly a man in the country who is recognized in the profession who is not a member of the Society, or would be if there were not a few of his friends who objected to it. I think, therefore, that all this question of looking for recognition and demanding that we have our rights, and not only that, but that we shall instruct the American people as to our great merits, and how foolish they would be if they did not call us in at good salaries, had better be dropped. As a matter of fact, we are always recognized, and any recognition that we get that is sought is not nearly as creditable to us as the recognition we have so far had unsought. I think the simplest way to get rid of the whole matter would be to have a vote on the broad question, or else lay it on the table.

Mr. GREEN.—Mr. O'Rourke is quite right, but if the Society is named in any resolution which is to be brought before Congress, Congress would be suspicious at once, and we had better say the civil engineering profession at large, which we know includes this Society and nobody else practically. It sounds better and would be more effective. I live in Washington.

Mr. COOPER.—Isn't it a little late in the day for members, going through the mathematical problems that we have, to try to establish an axiom? That is what I understand we are trying to do. We are trying to vote that we are an important body of men in this country, and that we are useful to our people. It seems to me that is an axiom, and self-evident. I would, therefore, move that this whole matter be laid upon the table.

Convention
of 1903.

A MEMBER.—I second the motion.

The PRESIDENT.—A motion to lay on the table is always in order.

The motion, being put to a vote, was carried.

The SECRETARY.—The next business before the Society is a letter which the Secretary received from Roberto Gayol, M. Am. Soc. C. E.

MEXICO, December 27th, 1901.

CHARLES WARREN HUNT, Esq.,
New York, N. Y.

MY DEAR SIR,—I should be greatly obliged to you, if, at the next Annual Meeting of the Society, which will be held this year in New York, you would kindly propose that the next meeting, to be held in 1903, should be held in the City of Mexico, as the Mexican engineers would feel highly honoured in receiving a visit from the distinguished members of the American Society of Civil Engineers, and I feel no doubt that if this proposal is accepted, we will be able to make the visit pleasant to those gentlemen, and arrange some excursion, so as to enable them to see some of the principal points in the country.

Hoping my proposition will be accepted, I remain,

Yours very sincerely,

ROBERTO GAYOL.

The decision as to where the Convention of 1903 will be held will probably be placed in the hands of the Board of Direction; that is the way it has always been done before. I merely read this letter to the meeting as the gentleman requests.

The PRESIDENT.—The matter will take the usual course of correspondence.

Mr. OWEN.—Would it be out of order to offer a motion expressing the opinion of this meeting to the Board of Direction?

The PRESIDENT.—The meeting may express any opinion which is not in the nature of an instruction.

Mr. OWEN.—If it is in order, I would make a motion that it is the sense of this meeting that the most desirable place for the Annual Convention of 1903 would be in the City of Mexico.

The motion was seconded.

Mr. OCKERSON.—Is that motion before the house now?

The PRESIDENT.—I believe it was seconded.

Mr. OCKERSON.—I would like to call the attention of the Society to the fact that the great Louisiana Purchase Exposition is to be held in St. Louis in 1903.

Mr. OWEN.—I withdraw my motion, then.

The PRESIDENT.—The motion is withdrawn.

The SECRETARY.—I now have the report of the Tellers.

The PRESIDENT.—The report of the Tellers will now be read by the Secretary.

Report of
Tellers.**Report of Tellers Appointed to Canvass the Ballot for the Election of
Officers at the Annual Meeting, January 15th, 1902.**

Whole number of ballots received.....	590
Without signature.....	11
Counted.....	579

For President:

Robert Moore.....	574
James D. Schuyler.....	2
Onward Bates.....	1
James William Way.....	1
George Y. Wisner.....	1
Defective.....	1

For Vice-Presidents:

John R Freeman.....	569
Charles C. Schneider.....	572
Robert Moore.....	1
A. Mackenzie.....	2
Henry G. Prout.....	1
Adolphus Bonzano.....	1
Frank C. Osborn.....	1
Mansfield Merriman.....	1
Defective.....	2
Blank.....	1

For Treasurer:

Joseph M. Knap.....	579
Blank.....	1

*For Directors:**District No. 1:*

Richard S. Buck.....	572
John Bogart.....	1
F. Stuart Williamson.....	1
William P. Field.....	1
Nelson P. Lewis.....	1
Blank.....	2
Defective.....	1

District No. 1:

George H. Pegram.....	573
Josiah A. Briggs.....	1
Blank.....	5
Defective.....	1

District No. 1:

William J. Wilgus.....	566
George S. Rice.....	1
Louis L. Tribus.....	1
Alfred Craven.....	1
Clemens Herschel.....	1
Joseph O. Osgood.....	1
Alfred P. Boller.....	1
Francis T. Fisher.....	1
Blank.....	6
Defective.....	1

District No. 2:

William Jackson.....	576
J. R. Worcester.....	1
Blank.....	2
Defective.....	1

District No. 3:

Edmund F. Van Hoesen.....	575
William A. Haven.....	1
Blank.....	3
Defective	1

District No. 7:

James L. Frazier.....	572
B. S. Wathen.....	1
A. J. Tullock	1
James D. Schuyler.....	1
James L. Lusk.....	1
D. C. Henney.....	1
William Wood.....	1
Blank.....	1
Defective.....	1

Respectfully submitted,

JOHN B. DUNCKLEE,
G. W. BRAMWELL,

JANUARY 15TH, 1902.

Tellers.

The PRESIDENT.—The following gentlemen are declared to be elected to the offices for which they were nominated: Robert Moore, President; C. C. Schneider, Vice-President; John R. Freeman, Vice-President; Joseph M. Knap, Treasurer; Directors, W. J. Wilgus, George H. Pegram, Richard S. Buck, William Johnson, E. F. Van Hoesen and J. L. Frazier.

The SECRETARY.—Although it has not been a matter of custom, it seems to me it would be a matter of courtesy to have a vote of thanks given to the tellers who have performed this arduous labor of counting the ballots for the last two or three hours.

Mr. GREEN.—I move that such a vote of thanks be given.

The motion, being duly seconded, was put to a vote and carried unanimously.

The SECRETARY.—Unless there is some new business, I would like to make one or two announcements.

The PRESIDENT.—Is there any other business before the house?

Mr. OCKERSON.—I have a resolution which I would like to offer:

Resolved, That the American Society of Civil Engineers heartily favors the collection of a representative engineering exhibit for the Louisiana Purchase Exposition to be held in St. Louis in 1903, to illustrate in a creditable way the important part that the engineering profession has taken in the material progress of the country during the past century, and to this end we recommend the earnest co-operation of all members of this and other engineering societies.

The motion was seconded.

Louisiana
Purchase
Exposition
(continued).

Mr. OCKERSON.—I would like to explain the scope of the exposition, if I may be permitted, in about five minutes. I have written my remarks, in order that I might confine myself strictly to the text, and save your time.

I have the honor to represent the Department of Liberal Arts in the Louisiana Purchase Exposition, which has been inaugurated to celebrate in St. Louis the anniversary of the purchase of that vast territory formerly known as Louisiana.

This Exposition is international in character, and the President of the United States has invited all foreign governments to participate. The investment of the United States in this Exposition will exceed \$6 000 000, and the City of St. Louis and the State of Missouri have pledged \$11 000 000 more.

It is evident, therefore, that this is to be an exposition worthy of the event whose anniversary it celebrates.

There is no one transaction, in the stirring history of our country from its infancy down to the present time, that approaches in importance the acquisition of that great empire, with its wealth of minerals, soil and other natural resources.

In its development for the uses of man, the engineer has always been the pioneer. He has built railways across the trackless plains; he has tunneled the mountains; he has bridged the rivers; he has built storage reservoirs and irrigating canals which have made the desert plains to blossom with fertile fields and filled them with thrifty and happy homes. The greater part of this has been done within the past fifty years, and it is not too much to say that the engineer has made this remarkable progress possible, and to him should large credit be given.

It is especially fitting then, that the engineer should take the opportunity afforded by this exposition to show to the world how important his share of the work has been, and to fix a bench-mark from which the future progress of the profession can be measured.

The growth of the profession and its achievements during the past half century have been little less than marvelous.

The military school at West Point, not many years ago, was the only engineering school in the country. Now there are many well equipped schools of engineering throughout the length and breadth of the land, where students receive the most thorough training in all branches of civil engineering.

Not many years ago, Hasler was induced to come to this country to take charge of a very small department of the Government, charged with the survey of some of our harbors. There was not a single engineer in the country who was regarded as competent to conduct even that small work.

When Hasler appealed to the President for an increase in salary,

as engineers will do sometimes, even now, the President said: "Why, Mr. Hasler, I don't pay my Secretary of the Treasury more than I do you." Hasler replied, "That is all very well; you can get plenty of men for the post of Secretary of the Treasury, but there is only one Hasler—only one." It is needless to say that the increase of pay asked for was granted.

The same argument might not work quite as well to-day, as there would probably be another Hasler in the field.

I am extremely anxious to see our profession raised, in the esteem of the public, to the station held by the engineer in foreign lands, and it occurs to me that here is an opportunity to show to the public in an unmistakable way how large a share the engineer has had in the material progress of the country. If carried out in the proper way, it would do far more to establish the profession high up among the so-called learned professions, than any code of ethics that could possibly be devised.

I sincerely hope, therefore, that I will have the hearty co-operation of every member of the American Society of Civil Engineers, to the end that I may be able to secure a full line of exhibits, in the shape of models, drawings, maps and literature covering all fields of engineering and illustrating the progress made therein.

Gentlemen, an earnest effort on your part along the lines indicated, will not only be very gratifying to me, but it will, I am sure, be of substantial and lasting benefit to the engineering profession.

The following is a general outline of the engineering exhibits desired at the Louisiana Purchase Exposition.

Group 25, Civil Engineering.

- Class 136. Building materials (other than timber), materials extracted from quarries, metals and ceramic products; lime, cement, plaster, artificial stone, etc. Equipment and methods of production of these materials.
- Class 137. Methods of testing building materials.
- Class 138. Preparation of building materials; implements and methods used by stone cutters, masons, carpenters, slaters, joiners, locksmiths, plumbers, glaziers, painters, etc.
- Class 139. Equipment for and methods used in earth-work; hand tools, excavators, scrapers, barrows, dump-carts, service tracks, hand-carts, trucks, etc.
- Class 140. Military defenses and accessories; engineering material employed in the operations of an army.
- Class 141. Equipment for and methods used (other than pumps) for preparing foundations; piles, pile-drivers, screw-piles, pneumatic apparatus, etc.
- Class 142. Equipment for and methods of transporting and distributing materials.
- Class 143. Equipment and methods for the maintenance of roads, streets, promenades, etc.
- Class 144. Equipment for lighting sea coasts, channels, mine-fields and beacons. Military and naval material for same.

Louisiana
Purchase
Exposition
(continued).

- Class 145. Equipment for and methods used in distributing water and gas (not including gas meters).
- Class 146. Equipment for and methods used in pneumatic telegraphy
- Group 26, Models, Plans and Designs for Public Works.
- Class 147. Roads and other public highways on land. Bridges and viaducts.
- Class 148. Inland navigation; improvement of rivers; construction of canals, dams, locks, lifts, fixed bridges, or draw-bridges, canal bridges, reservoirs and feeders; pumping stations, mechanical towing, and warping; equipment used for the development of river ports.
- Class 149. Sea ports; general arrangements; jetties, basins, locks, swing bridges; equipment for development (not including shipping).
- Class 150. Maritime canals.
- Class 151. Irrigating canals and systems.
- Class 152. Provision of lights and beacons for sea coasts.
- Class 153. Protection against flooding by rivers or by sea.
- Class 154. Railways as regards plan and profile of the line, and engineering works.
- Class 155. Construction and maintenance of streets in cities.
- Class 156. Water supply, sanitation and gas lighting of cities.
- Class 157. Statistics, maps and publications relative to public works.

Group 27. Architectural Engineering.

- Class 158. Models and plans of public buildings for special purposes; large and small dwelling houses.
- Class 159. Models, drawings and specifications for foundations, walls, partitions, floors, roofs and stairways.
- Class 160. Designs and models of special contrivances for safety, comfort, and convenience in the manipulation of elevators, doors, windows, etc.
- Class 161. Working plans for the mason, carpenter and painter; designs and models of bonds, arches, coping, vaulting, etc.; plastering and construction of partitions; painting and glazing.

I thank you very much for the kind attention you have given me.

The PRESIDENT.—The question is on Mr. Ockerson's resolution that this meeting favors an exhibit at the Louisiana Purchase Exposition.

The motion being put to vote was carried.

The SECRETARY.—I have to announce that the programme of the Annual Meeting will be carried out as printed, with only one important change. The Reception will be held this evening, as scheduled, and to-morrow morning at 10 o'clock the party will leave the Society House to inspect the Rapid Transit work. After visiting the station at Fifty-ninth Street the party will inspect the work on Broadway, as far as Forty-second Street, and then along the latter to Park Avenue. On Park Avenue the upper tunnel heading, at Forty-first Street, will be visited, instead of the lower heading at Thirty-fourth Street, as at first intended.

From Forty-first Street the party will proceed to Delmonico's, at Forty-fourth Street and Fifth Avenue, and there take lunch with Mr. O'Rourke. The first intention was to have the lunch served in the vaults of the new Stock Exchange Building, but this has not been found practicable. After lunch the party will visit Mr. O'Rourke's work at the Stock Exchange and Hanover Bank Buildings.

In the evening the Smoker will be held at the Society House, as stated in the programme.

The following letter has been received from Mr. George H. Pegram:

NEW YORK, January 14th, 1902.

Invitation
from Manhat-
tan Railway
Company.

CHARLES WARREN HUNT, Esq.,
Secretary,

American Society of Civil Engineers.

DEAR SIR.—The members of the Society attending the Annual Meeting are respectfully invited to visit the power station of the Manhattan Railway Company at Seventy-fourth Street and East River. Admission may be obtained by presenting badge at the door.

Yours respectfully,

GEO. H. PEGRAM,
Chief Engineer.

Announce-
ments.

The SECRETARY.—There will be a meeting of the Board of Direction in the Secretary's office at 2 o'clock, and it is requested that every member of the Board present will attend promptly. The Constitution provides that there shall be nine members of the Board at meetings to be held at the Annual Meetings in order to make a quorum.

The PRESIDENT.—Is there any other business before the meeting? If not, a motion to adjourn is in order.

A MEMBER.—I move we adjourn.

The PRESIDENT.—I wish, gentlemen, to thank you for the courtesy that has been displayed to me. Success has attended our efforts during the past year to increase the Society and to have good meetings and valuable papers presented. Before I resign the gavel, I wish to introduce to you the only one of the newly elected Vice-Presidents who is present. We are very sorry that Mr. Moore is not present, or that Mr. John R. Freeman is not present, but we have with us Mr. C. C. Schneider.

I herewith tender to you, Mr. Schneider, the gavel, and I would say, in the words of a great author:

"It seems to me a message from the world of spirits when any man obtains that which he merits and in turn merits that which he obtains."

C. C. SCHNEIDER, Vice-President, Am. Soc. C. E.—I think it is not in the province of the Vice-President to make a speech; that honor belongs to the newly elected President, and as he is not here at the present time I prefer that he would make his own speech at the proper time.

The Society then adjourned.

EXCURSIONS AND ENTERTAINMENTS AT THE FORTY-NINTH ANNUAL MEETING.

Wednesday, January 15th, 1902.—After the business meeting, lunch was served at 1.30 p. m. in the Lounging Room. At 3 p. m. John F. O'Rourke, M. Am. Soc. C. E., described the foundation work on the new Stock Exchange Building and the new Hanover Bank Building, illustrating his remarks with lantern slides; and William Barclay Parsons, M. Am. Soc. C. E., described the main features of the Rapid Transit Tunnel Work, also using lantern slides to illustrate his remarks.

At 9 p. m. a reception was held in the Society House, which was very largely attended.

Thursday, January 16th, 1902.—At 10 a. m. the members met at the Society House, and, under the guidance of William Barclay Parsons, M. Am. Soc. C. E., Chief Engineer of the Rapid Transit Commission, and the assistant engineers connected with the work, proceeded to inspect the Rapid Transit Work. The station at Broadway and Fifty-ninth Street and a portion of the tunnel to the south were lighted for the occasion. The various works on Broadway, south as far as Forty-second Street and along the latter street to Park Avenue, were visited. On Park Avenue, at Forty-first Street, the heading of the Park Avenue tunnel was inspected, and from this point the members proceeded to Delmonico's, at Forty-fourth Street and Fifth Avenue, where they were entertained at lunch by Mr. John F. O'Rourke.

After lunch, the party visited the new Stock Exchange and Hanover Bank Buildings and inspected the deep foundation work there under way.

In the evening there was an informal "Smoker" at the Society House.

The following list contains the names of 435 members of various grades, who registered as being in attendance at the Annual Meeting. This list is incomplete, on account of the failure of many members to register, and it does not include the names of any of the guests of the Society or of individual members:

Aiken, W. A.....Pittsburg, Pa.	Baldwin, W. J.....New York City
Allen, C. H.....New York City	Basinger, J. G....New York City
Allen, W. A.....Manhattan, N. J.	Baum, George...Bloomfield, N. J.
Allen, W. H...New Haven, Conn.	Belknap, W. E....New York City
Andrews, Horace...Albany, N. Y.	Bellinger, L. F...Brooklyn, N. Y.
Asserson, P. C....Brooklyn, N.Y.	Benton, Lewis S...New York City
Averill, F. L...Washington, D. C.	Berg, W. G.....New York City
Bacon, J. W.....Danbury, Conn.	Berger, Bernt.....New York City
Bailey, G. I.....Albany, N. Y.	Bettes, C. R.....New York City
	Bengler, E. J.....Boston, Mass.

Binion, Joshua....New York City	Codwise, E. B....Kingston, N. Y.
Bishop, G. H. Middletown, Conn.	Coffin, Amory....New York City
Bissell, H. ....Boston, Mass.	Cogswell, W. B....Syracuse, N. Y.
Blakeley, G. H... Paterson, N. J.	Colby, S. K.....New York City
Blakeslee, C....New Haven, Conn.	Cole, H. J.....New York City
Blanchard, A. H. Providence, R. I.	Collier, B. C.....New York City
Bogart, John.....New York City	Collingwood, F....New York City
Boller, A. P.....New York City	Conkling, L. de V. Elmira, N. Y.
Boller, A. P., Jr. East Orange, N.J.	Cook, John H.....Passaic, N. J.
Bond, Edward A ... Albany, N. Y.	Cooke, C. H.....New York City
Bonzano, A....Philadelphia, Pa.	Cooper, Theo.....New York City
Bott, J. B.....Greensburg, Pa.	Cornell, G. B.... New York City
Bouton, G. H.....Boonton, N. J.	Cornell, J. N. H....New York City
Bowman, A. L....New York City	Coverdale, W. H..New York City
Brackenridge, J.C. Brooklyn, N. Y.	Crandall, C. L Ithaca, N. Y.
Braine, L. F.....New York City	Crane, W. E.....New York City
Bramwell, G. W... New York City	Craven, A.....New York City
Brendlinger, P.F. Philadelphia, Pa.	Croes, J. J. R.....New York City
Breuchaud, J.....Yonkers, N. Y.	Crowell, Foster....New York City
Brinekerhoff, H. W. New York City	Cuddeback, A. W. Paterson, N. J.
Brinsmade, D. S....Derby, Conn.	Cudworth, F. G...New York City
Brooks, Fred.....Boston, Mass.	
Brown, Le Grand....Ithaca, N.Y.	Darrach, C. G..Philadelphia, Pa.
Brown, Thomas E. New York City	Davies, J. V..... New York City
Brush, W. W.....New York City	Davis, A. L .....New York City
Buck, L. L.....New York City	Davis, Chandler...New York City
Buck, R. S..... New York City	Davis, C. E.....Montclair, N. J.
Burden, J. A.....New York City	Davis, R. B.....Boston, Mass.
Burdett, F. A.....New York City	Dean, Luther....Taunton, Mass.
Bush, E. W..... Hartford, Conn.	Deans, J. S.... Phænixville, Pa.
Butts, E. P.....Holyoke, Mass.	Devin, George.....New York City
Carr, Albert...East Orange, N. J.	Deyo, S. L. F.....New York City
Carter, S.....Richmond, Va.	Diebitsch, E.....New York City
Cattell, W. A.....New York City	Dougan, J..... New York City
Chapleau, S. J.....Ottawa, Can.	Drake, A. B..New Bedford, Mass.
Chase, J. C.....Derry, N. H.	Dunklee, J.B. South Orange, N.J.
Chase, R. D.....New York City	Duryea, Edwin,Jr.Brooklyn, N.Y.
Chester, J. N.....Pittsburg, Pa.	
Christian, G. L....New York City	Easby, M. W...Philadelphia, Pa.
Christy, G. L....New York City	Edwards, J. H....Oxford, N. Y.
Clapp, O. F....Providence, R. I.	Ehle, Boyd....East Creek, N. Y.
Clark, G. H.....New York City	Elliott, J. S... Washington, D. C.
Clarke, John A.,Jr.New York City	Ellis, J. W....Woonsocket, R. I.
Clarke, St. J.....New York City	Endemann, H. K..Brooklyn, N.Y.

Erlandsen, O..... New York City
Evans, J. M..... Brooklyn, N.Y.
Evans, M. E..... New York City

Fairchild, John F. Mt. Vernon, N.Y.
Farley, J. M... White Plains, N.Y.
Farnum, H. H.... New York City
Farrington, H.... New York City
Ferris, F. E.... Jersey City, N. J.
Field, William P... Newark, N. J.
Fisher, Clark Trenton, N. J.
Fisher, F. D..... New York City
Fisher, Wager.. Philadelphia, Pa.
FitzGerald, J. L.

Schenectady, N. Y.
Foster, T. J..... New York City
Fouquet, J. D..... Fishkill, N. Y.
Francis, Geo. B. Providence, R. I.
Freeman, John R.

Providence, R. I.
French, A. H.... Brookline, Mass.
French, J. B..... New York City
Frick, Walter ... Carbondale, Pa.
Frost, G. H..... New York City
Frost, Geo. S..... New York City
Fuller, Geo. W.... New York City
Fuller, W. B..... New York City
Furber, W. C... Philadelphia, Pa.

Gardiner, F. W... New York City
Garrison, F. L...Philadelphia, Pa.
Gartensteig, C.... New York City
Gay, C. W..... Lynn, Mass.
Gerber, E..... Philadelphia, Pa.
Gifford, G. E..... New York City
Gillespie, R. H... New York City
Goldsborough, J. B.

New York City

Gould, E. S..... Yonkers, N. Y.
Gowen, C. S.... Ossining, N. Y.
Graham, J. M....Baltimore, Md.
Granberry, J. H... New York City
Grant, T. H..... Red Bank, N. J.
Graves, E. D..... Hartford, Conn.
Gray, W..... New York City

Green, B. R... Washington, D. C.
Greene, Carleton.. New York City
Greene, F. S.....New York City
Greene, G. S., Jr.. New York City
Gregory, C. E.....New York City
Greiner, J. E.....Baltimore, Md.

Hague, Chas. A... New York City
Haight, S. S.....New York City
Haines, C. W...Philadelphia, Pa.
Haines, H. S..... New York City
Hall, M. W New York City
Hammer, R. H...Brooklyn, N. Y.
Hankinson, A. W.. New York City
Harby, I..... New York City
Harding, W. S.. Philadelphia, Pa.
Hardy, G. R... Forest Hills, Mass.
Harrington, F. F. Brooklyn, N. Y.
Harrington, J. L.. New York City
Harris, C. M New York City
Harrison, A. W. Erie, Pa.
Harwi, S. J..... Bayonne, N. J.
Haskins, W. J.....New York City
Hanck, W..... New York City
Haviland, A..... New York City
Hayes, E..... Cohoes, N. Y.
Hayes, S. W..... Newark, N. J.
Hazen, Allen..... New York City
Hazelton, C. W.

Turners Falls, Mass.
Hemming, D. W... New York City
Hendrick, C. W... New York City
Henry, P. W..... New York City
Herbert, H. M. Bound Brook, N. J.
Hering, Rudolph .. New York City
Hickok, H. A. . . . Newark, N. J.
Hill, A. B.....New Haven, Conn.
Hill, Geo..... New York City
Hinds, F. A.... Watertown, N. Y.
Hoag, S. W., Jr... New York City
Hodge, H. W..... New York City
Hoff, Olaf..... New York City
Hoffman, N. B. K. . New York City
Honness, G. G.... Paterson, N. J.
Hook, C. A..... Baltimore, Md.

Horton, S.....Indianapolis, Ind.
Horton, Theo.....New York City
Hough, D. L.....New York City
Hovey, O. E.....Pencoyd, Pa.
Howe, H. J.....New York City
Hoyt, J. T. N.....New York City
Hoyt, William E.

Rochester, N. Y.
Humphrey, R. L. Philadelphia, Pa.
Hunt, Charles Warren

New York City

Hunt, R. W.....Chicago, Ill.
Hunter, R. E....Montreal, Canada
Hurry, E. H.....Bethlehem, Pa.
Hyde, A. L....New Haven, Conn.

Irving, W. E.....New York City

Jackson, J. M. Schenectady, N. Y.
Jacoby, H. S.....Ithaca, N. Y.
Johnson, AlexNew York City
Johnson, L. J....Cambridge, Mass.
Jonson, Ernst.....New York City

Kaufman, G.....New York City
Kelley, J. A....Philadelphia, Pa.
Kelley, W. D.....New York City
Keuly, W. L.....Baltimore, Md.
Kennedy, John. Montreal, Canada
Kenney, E. F....Philadelphia, Pa.
Khuen, R., Jr.....Pittsburg, Pa.
Kimball, Geo. A....Boston, Mass.
King, Paul S.....New York City
King, Wallace, Jr. New York City
Kingsley, T. P....New York City
Klapp, Eugene....New York City
Knap, E. D.....New York City
Knap, J. M.....New York City
Knight, F. B.....New York City
Kuichling, E....Rochester, N. Y.

Landreth, O. H.....Ithaca, N. Y.
Langton, John....New York City
Lant, F. P.....New York City
Lea, S. HBirmingham, Ala.

Leavitt, C. W., Jr. New York City
Leavitt, F. M.....New York City
Lee, W. BNew York City
Leffingwell, F. D...New York City
Lehlbach, G.....Newark, N. J.
Leonard, H. R. Philadelphia, Pa.
Lewis, N. P.....Brooklyn, N. Y.
Lindenthal, G.....New York City
Livingston, J. I.

Bonnd Brook, N. J.

Long, E. McL....New York City
Loomis, Horace...New York City
Low, G. E.....New York City
Lowinson, ONew York City
Ludwig, A.....New York City
Lundie, JohnNew York City
Luster, W. H., Jr. Elizabeth, N. J.

Macdonald, A. A..New York City
Macdonald, CNew York City
Machen, H. B.....New York City
Maenab, G. T.....New York City
McCann, T. H....Hoboken, N. J.
McComb, C. O. Watertown, N. Y.
McGregor, R. A...New York City
McKenna, C. F....New York City
McKenzie, T. H . Hartford, Conn.
McKim, A. R.....New York City
McMinn, T. J.....New York City
McNicol, J. A.....New York City
McNulty, G. W...New York City
Magor, H. B.....New York City
Malukoff, A. J....New York City
Manley, H.....Boston, Mass.
Marden, H. H., Jr. New York City
Marple, W. McK...Scranton, Pa.
Martin, C. C.....New York City
Martin, K. L.....Brooklyn, N. Y.
Martin, W. B.....New York City
Mayer, Joseph....New York City
Mead, C. A.....Newark, N. J.
Mead, E.....Washington, D. C.
Meem, J. C.....New York City
Merryman, W. C...New York City
Metcalf, L....Washington, D. C.

- Meyer, H. C.....New York City
Miller, H. A.....Clinton, Mass.
Miller, R. P.....New York City
Mills, C. M.....Philadelphia, Pa.
Miner, C. A....Washington, D. C.
Moore, C. H.....New York City
Moore, W. H..New Haven, Conn.
Morse, C. M.....Buffalo, N. Y.
Moses, P. R.....New York City
Myers, C. H.....New York City
- Neumeyer, R. E..Bethlehem, Pa.
Nichols, C. H..New Haven, Conn.
Nichols, O. F....Brooklyn, N. Y.
North, E. P.....New York City
Nostrand, P. E....New York City
Nye, A. SNew York City
- Oastler, W. C.....New York City
O'Brien, J. H...Providence, R. I.
Ockerson, J. A.....St. Louis, Mo.
Odell, F. S.....New York City
Olcott, E. E.....New York City
Olney, L. F.....New York City
O'Rourke, J. F....New York City
Osgood, J. O.....New York City
Owen, Jas.....Newark, N. J.
- Parker, A. McC...New York City
Parsons, H. de B..New York City
Parsons, W. B....New York City
Patterson, J. A..Philadelphia, Pa.
Pegram, G. H.....New York City
Perkins, P. S...Providence, R. I.
Pierce, W. T.....Boston, Mass.
Piper, A. R.....Ossining, N. Y.
Pitts, T. D..... New York City
Poik, W. A.....New York City
Pollock, C. D.....New York City
Potter, Alex.....New York City
Pratt, W. A....Philadelphia, Pa.
Prince, A. D.....New York City
Prout, H. G.....New York City
Pruyn, F. L.....New York City
- Raasloff, H de New York City
Ramsey, E. P.... New York City
- Reed, W. B.....New York City
Reynolds, J. O....New York City
Rhodes, F. D.....New York City
Rice, G. S. New York City
Richardson, C....New York City
Richardson, T. F..Clinton, Mass.
Ricketts, P. C.....Troy, N. Y.
Ridgway, R.....New York City
Ritchie, J. ... Cleveland, Ohio
Roberts, P., Jr.Philadelphia, Pa.
Rosenberg, F.....New York City
Rosenthal, A...Mt. Vernon, N. Y.
Rotch, W Boston, Mass.
Rowland, T. F....New York City
Ryan, M. H.....New York City
Ryder, E. M. T..New Haven, Conn.
- Sabin, A. H.....New York City
Saunders, W. L...New York City
Schmitz, F. C....New York City
Sehneider, A.....New York City
Schneider, C. C.Philadelphia, Pa.
Schwiers, F. W....New York City
Seaman, H. B....New York City
Shaler, I. A.....New York City
Sherrerd, M. R....Newark, N. J.
Shryock, J. G., Jr. Philadelphia, Pa.
- Simpson, G. F.....New York City
Skinner, F. W.....New York City
Smith, C. W.....New York City
Smith, E. R.....Islip, N. Y.
Smith, J. W.....Paterson, N. J.
Smith, L. C. L. Long Island City, N. Y.
- Smith, W. F.....New York City
Snow, J. P.....Boston, Mass.
Sooysmith, C.....New York City
Soper, G. A.....New York City
Stanton, F. McM. Atlantic Mine, Mich.
- Stanton, R. B....Sewickley, Pa.
Stearns, F. P.....Boston, Mass.
Stern, E. W.....New York City
Stevens, A.....New York City
Stidham, H.....New York City

- Stiger, J. S., Jr....Mendham, N. J.
Stoddard, G. C....New York City
Stowe, H. C.....New York City
Stuart, A. A.....Quebec, Can.
Swindells, J. S....Mt. Kisco, N. Y.

Taber, G. A.....New York City
Taylor, C. F....East Boston, Mass.
Taylor, L. A.....Boston, Mass.
Thomas, G. E....Annapolis, Md.
Thomes, E. H.....New York City
Thompson, S. C....New York City
Thompson, S. E.
 Newton Highlands, Mass.
Thomson, A., Jr....New York City
Thomson, G. H....Ossining, N. Y.
Thomson, T. K....New York City
Thornley, J.....New York City
Tibbals, G. A.....New York City
Tibbals, S. G.....New York City
Tilden, C. J.....New York City
Tomlinson, A. T....Boston, Mass.
Tompkins, E. DeV.
 New York City
Tompson, G. M....Boston, Mass.
Travell, W. B.....New York City
Treadwell, L....Portsmouth, N. H.
Tribus, L. L.....New York City
Triest, W. G. F....New York City
Trotter, A. W.....New York City
Tucker, L. W....Boston, Mass.
Tucker, W. C....New York City
Turner, D. L.....New York City
Tuska, G. R.....New York City

Ulrich, D.....New York City
Upham, C. C....New York City
Upham, R. D.....New York City

Value, B. R.....New York City
Van Horne, J. G....New York City
Van Orden, C. H....Catskill, N. Y.
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 New York City

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Webster, G. S....Philadelphia, Pa.
Webster, W. R....Philadelphia, Pa.
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Wells, C. E.....Clinton, Mass.
Wells, J. A.....New York City
Wells, J. H.....New York City
Wheeler, S. S....New York City
Whimery, S.....New York City
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White, F. G.....New York City
White, L.....New York City
White, T. S....Beaver Falls, Pa.
Whitney, F. O....Boston, Mass.
Whitson, A. U....New York City
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Wiggin, E. W....New Haven, Conn.
Wilcock, F.....New York City
Wiley, W. H.....New York City
Williamson, F. S....New York City
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Wilson, C. W. S.
 New Rochelle, N. Y.
Wölfel, Paul L....Pencoyd, Pa.
Woodbury, C. J. H....Boston, Mass.
Wortendyke, N. D.
 Jersey City, N. J.
Wright, J. B.....New York City

York, H. W.....New York City

Zollinger, L. R....Philadelphia, Pa.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, March 5th, 1902.—8.30 p. m.—At this meeting ballots for membership and ballots on the proposed Amendment to the Constitution will be canvassed, and a paper by George S. Morison, Past-President, Am. Soc. C. E., entitled "The Bohio Dam," will be presented for discussion.

This paper was printed in the *Proceedings* for January, 1902.

Wednesday, March 19th, 1902.—8.30 p. m.—At this meeting a paper by C. A. P. Turner, M. Am. Soc. C. E., entitled "Thermo-Electric Measurement of Stress," will be presented for discussion.

This paper was printed in the *Proceedings* for January, 1902.

Wednesday, April 2d, 1902.—8.30 p. m.—At this meeting ballots for membership will be canvassed, and two papers will be presented: one by Marsden Manson, M. Am. Soc. C. E., entitled "A Brief History of Road Conditions and Legislation in California," and the other by Charles C. Wentworth, M. Am. Soc. C. E., on "Line and Surface for Railway Curves."

These papers are printed in this number of *Proceedings*.

Wednesday, April 16th, 1902.—8.30 p. m.—At this meeting two papers will be presented for discussion, as follows: "Is It Unprofessional for an Engineer to be a Patentee?" by Archibald R. Eldridge, M. Am. Soc. C. E.; and "The Stiffening System of Long-Span Suspension Bridges for Railway Trains," by Joseph Mayer, M. Am. Soc. C. E.

These papers are printed in this number of *Proceedings*.

ANNUAL CONVENTION OF 1902.

The Thirty-fourth Annual Convention of the Society will be held at Washington, D. C., beginning on Tuesday, May 20th, 1902.

CURRENT ENGINEERING LITERATURE.

The interest which has been manifested in this monthly list of references has led the Committee on Publications to decide that hereafter this list shall be printed on one side of the page only. Several mem-

bers have asked that this be done so that anyone may cut out, for scrap-book or card-index use, that part of the classified list which may be of special interest to himself.

That this publication has proved of service to members is gratifying. It often takes a long trial to ascertain whether money expended in new ways is well spent, for the reason that expressions of approval seem to members to be gratuitous and unnecessary, and are, consequently, not often heard. It is therefore suggested that interest in the publications which is manifested by suggestions for improvement which are to the point will always be received with appreciation by the Committee on Publications.

PRESENTATION OF PAPERS.

It will be noticed that a new departure has been made in assigning the dates for the presentation of the four papers printed in this number, two of them having been scheduled for the first April meeting, and two for the second meeting of that month. The increasing number of papers makes this policy necessary, and inasmuch as the practice of the reading in full of any but an extremely short paper has been abandoned, it is hoped that added interest in meetings will result in the discussion of more than one subject in one evening. The Committee on Publications some time ago authorized the Secretary to request, when in his judgment it was advisable, that the author of an accepted paper prepare an abstract of it which in his absence might be read to the meeting by the Secretary. The Committee has not cared to require such an abstract, feeling that the furnishing of it should be optional with the author. Sooner or latter it will be necessary to present all papers briefly, in order to secure proper time for discussion, and it is here suggested that a brief abstract, either of a paper or of a long written discussion, giving the premises on which argument is based, or the general results of mathematical or experimental investigation, and the author's conclusions, will always be acceptable, and can be used to the advantage of members who attend the meetings, not only in concentrating attention on the subject, but in the suggestion of new ideas which may add to the interest of the verbal discussion which follows.

TOPICS FOR DISCUSSION AT THE ANNUAL CONVENTION.

It will be remembered that at the last three Conventions no formal papers have been presented, but that in their stead topics of general interest have been presented for discussion. The resulting attendance and interest in convention meetings has shown the wisdom of the change, and the Committee on Publications will be glad to have members suggest topics suitable for discussion.

The following list of the subjects which have already been discussed at Conventions, is here printed, in order to give some idea of the kind of subjects desired :

LIST OF SUBJECTS PRESENTED FOR DISCUSSION AT THE LAST THREE ANNUAL CONVENTIONS.

- .. Should the use of the method of Wheel Concentrations be discontinued in determining the Stresses in Railroad Bridges?
- .. In view of present knowledge of the Effect of Repeated Applications of Load, should Fatigue Formulas be used in Bridge Design?
- .. (a) Should Stream Contamination by the Sewage of Cities be absolutely prohibited by law?
- .. (b) Should the Purification of the Sewage of Cities be compulsory, and is this feasible for Large Cities?
- .. (c) Is Filtration the coming solution of the Pure-Water Question for Cities?
- .. What is the Proper Friction Coefficient for use in the design of Riveted Steel Pipe?
- .. What are the economic conditions under which Electricity may be profitably substituted for Steam in the operation of Branch Railroad Lines, and what are the engineering requirements to be considered in such substitution?
- .. What is the present development of the so-called Telferage System for moving either Freight or Passengers? What are the conditions under which that System is preferable to movement by Rail, and what is its adaptability to still further application in competition with Rail Lines?
- .. Height of Buildings.
 - (1) What considerations should limit the height of buildings?
 - (2) Do recent developments in construction, sanitation, intercommunication and economy of administration, warrant the removal of all restrictions?
- .. Recent Practice in Rails.
 - The progressive increase in weight; the increase in hardness, particularly in carbon; the sections in most general use; the effect of changes in weight, composition and section.
- .. Filtration of Water for Public Use.
 - The several processes now used for the removal of objectionable matter; their comparative sanitary effect, cost and reliability.
- .. Do the interests of the profession, and the duty of its members to the public, require that only those who are competent be allowed to practice as Civil Engineers? Under what authority, through what agency, and upon what evidence of competency, should applicants be admitted to the practice of Civil Engineering?
- .. Steel-Concrete Construction.
 - What stress in tension and compression should be allowed in concrete?
 - What is the proper modulus of elasticity of concrete?
 - In Steel-Concrete Arches:
 - (1) What should be the ratio of steel section to concrete section, section, and what is the best form and disposition of the former?

- (2) What consideration should be given to temperature changes and consequent stresses?
 - (3) What are the best proportions for concrete, and what is the best method of placing it?"
- "The Decolorization of Water.
When is it necessary? How may it be accomplished?"
- "The Consumption of Water in Municipal Supplies and the Restriction of Waste."

SEARCHES IN THE LIBRARY.

As stated in the Annual Report, the Board of Direction has directed the Secretary to make a charge for such library searches and correspondence as do not fall within the regular duties of employees, which shall cover the actual cost of any extra work undertaken for an individual.

The only difficulty about this matter seems to be the impossibility of fixing in advance the scope and cost of any such search. It can only be said in general that the time of an employee competent to do such work is paid for by the Society at from 30 to 40 cents per hour, and that to this must be added the actual cost of typewriting.

Inasmuch as this idea was adopted experimentally, in the belief that it would prove of value to non-resident members, and as it is not the intention to realize any profit, it would seem that, in asking that such searches be made, the risk is not great, particularly as a limit of the total expense to be incurred might easily be specified by the member.

ACCESSIONS TO THE LIBRARY.

DONATIONS.*

(From January 8th to February 11th, 1902.)

THE MECHANICS OF ENGINEERING.

Volume I. Kinematics, Statics, Kinetics, Statics of Rigid Bodies and of Elastic Solids. By A. Jay Du Bois. Cloth, 11×8 ins., 34 + 634 pp., illus. New York, John Wiley & Sons, 1902. \$7.50.

This work is presented as the first volume of a series dealing with the applications of mechanics to engineering problems. It opens with a presentation of the fundamental principles of kinematics, statics and kinetics; then follow the practical applications. Throughout the work numerous problems and illustrative examples are given in direct connection with each important mechanical principle. In these applications the author has included the results of his own work in this direction, and he believes that the professional reader will find here new and valuable discussions of engineering problems, especially in the chapters on Masonry Walls and Dams, the Strength of Long Columns, the Swing Bridge, the Metal Arch, the Suspension System and the Stone Arch. There is an index of eight pages.

MUNICIPAL ENGINEERING AND SANITATION.

By M. N. Baker. $\frac{1}{2}$ Leather, 8×5 ins., 8 + 317 pp. New York, The Macmillan Company, 1902. \$1.25.

This volume is intended for that class of persons who, either as officials or as citizens, are striving to improve municipal conditions. It is designed to be a review of the whole field of municipal engineering and sanitation rather than an exhaustive study of one or a few branches of the subject. The most vital points, however, under each class of activities and interests have been dwelt upon, the underlying principles stated, and in many instances details from actual practice given. The preface states that while it is not expected that engineers and sanitarians will find in the book much relating to their specialties that is new to them, it is believed that the number and variety of subjects treated, and the comparative newness of some of the topics, will make the book helpful even to professional men. The Contents are: Introduction; Ways and Means of Communication; Municipal Supplies; Collection and Disposal of Wastes; Protection of Life, Health and Property; Administration, Finance and Public Policy. There is an index of six pages.

FOWLER'S ELECTRICAL ENGINEERS' YEAR BOOK

And Pocket Directory of Light, Power and Traction Stations. 1902. Leather, 6×4 ins., 429 pp., illus. Manchester, Scientific Publishing Company. 2 shillings, 9 pence.

In this second issue of the electrical handbook the scope of information has been considerably enlarged. The directory of technical information respecting the equipment of the various central electric light, power and traction stations in the United Kingdom has been thoroughly revised and brought up to date, in nearly every case having been personally checked by the engineer in charge. There is an index of twenty-four pages.

CROQUIS DE PONTS MÉTALLIQUES.

Par Jules Gaudard. Paper, 13×10 ins., 158 pp., plates. Paris, Ch. Béranger, 1901. (Donated by the Author.)

The Contents are: Ponts en Métal Moulé; Ponts en Fer ou Acier Laminé; Levage des Ponts Métalliques; Reception et Surveillance des Ponts. Poids des Fers. There is an index of four pages.

WASSERVERHÄLTNISSE DER SCHWEIZ.

Bearbeitet und herausgegeben von der hydrometrischen Abteilung des eidg. Oberbauinspektörates. Paper, 14×10 ins., 3 vols., plates. Berne, 1896-1901. (Donated by Hydrometrische Abteilung des eidg. Oberbauinspektörates in Berne.)

The Contents are: Rheingebiet von den Quellen bis zur Taminamündung; Erster Teil—Die Flächeninhalte der Einzugsgebiete, der Höhenstufengebiete von 300 zu 300 m.

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

über Meer, der Feishänge, Wälder, Gletscher und See'n; Zweiter Teil.—Die Pegelstationen hinsichtlich ihrer Anlage und Versicherung, sowie Darstellung der dazugehörigen Durchflussprofile und Relativen Wasserspiegelgefälle; Dritter Teil.—Die Längenprofile der fließenden Gewässer unter spezieller Berücksichtigung der ausgenützten und der für neue Wasserkraft-Anlagen noch verfügbaren Strecken, nebst typischen Querprofilen und den Höhenversicherungen; A. Vorder-Rhein und seine bedeutenderen Zuflüsse. Rhonegebiet von den Quellen bis zum Genfer-See; Erster Teil — Die Flächeninhalte der Einzugsgebiete, der Höhenstufengebiete von 300 zu 300 m. über Meer, der Feishänge, Wälder, Gletscher und See'n; Zweiter Teil—Die Pegelstationen hinsichtlich ihrer Anlage und Versicherung, sowie Darstellung der dazugehörigen Durchflussprofile und relativen Wasserspiegelgefälle.

THE TRANSITION CURVE OR CURVE OF ADJUSTMENT.

By the Method of Rectangular Co-ordinates and by Deflection Angles (Polar Co-ordinates). Based on the French of M. Nordling, with Additional Problems by N. B. Kellogg, M. Am. Soc. C. E. Cloth, $6\frac{1}{2} \times 4$ ins., 2 + 60 pp. San Francisco, N. B. Kellogg, 1899.

The following gifts have also been received:

Am. Inst. of Elec. Engrs. 1 bound vol.	N. Y. State College of Forestry. 1 pam.
Am. Inst. of Min. Engrs. 13 pam.	Nichols, Charles H. 1 pam.
Assoc. of Ry. Supts. of Bridges and Buildings. 1 pam.	Nicholson, G. B. 3 bound vol., 1 vol., 13 pam.
Brooklyn Engrs.' Club. 1 bound vol.	Ockerson, J. A. 3 pam.
Budger, Enrique. 20 bound vol., 15 vol., 117 pam.	Oesterreichischer Ingenieur- und Architekten-Verein. 2 nos.
Chickamauga Park Comm. 1 atlas.	Penn. Univ. 1 vol.
Colo. Agricultural Exper. Station. 1 pam.	Platt, T. C. 3 vol., 1 pam., 1 atlas.
Conn. R. R. Commr. 1 bound vol.	Rugg, A. P. 10 pam.
Corthell, E. L. 2 pam.	Soc. of Arts. 1 pam.
Eckel, Edwin C. 1 pam.	Soper, George A. 1 pam.
Greenhalge, F. B. 2 bound vol.	South Eastern Ry. Co. 2 pam.
Harrod, B. M. 4 bound vol.	Thurston, R. H. 1 pam.
Hutton, N. H. 1 pam.	Tomkins, Calvin. 1 pam.
Ill. Agricultural Exper. Station. 1 pam.	U. S. Chief of Engrs. 7 pam.
Inst. of Civ. Engrs. 2 pam.	U. S. Geol. Surv. 2 pam.
Inst. of Marine Engrs. 1 bound vol.	U. S. Interstate Commerce Comm. 1 pam.
Iron and Steel Inst. 1 bound vol., 1 pam.	U. S. Isthmian Canal Comm. 3 pam.
Jackson, William. 57 pam.	U. S. Light House Board. 1 vol.
Kernot, W. C. 2 pam.	U. S. Naval Observatory. 5 pam.
Kummer, F. A. 1 bound vol.	U. S. Ordnance Office. 1 pam.
Le Baron, J. F. 1 map.	U. S. War Dept. 1 bound vol.
McGill Univ. 1 bound vol.	U. S. Weather Bureau. 1 bound vol.
Madras Pub. Works Dept. 3 pam.	Vedeler, G. H. 2 pam.
Mead, Elwood. 1 bound vol.	Western Maryland R. R. Co. 19 pam.
Middletown, N. Y. Water Dept. 1 pam.	Wilson Brothers & Co. 1 pam.

BY PURCHASE.

Electrical Engineer's Pocket-Book. A Hand-Book of Useful Data for Electricians and Electrical Engineers. By Horatio A. Foster, M. A. I. E. E.; M. A. S. M. E. New York, D. Van Nostrand Company, London, E. & F. N. Spon, Ltd., 1901.

The Mineral Industry, Its Statistics, Technology and Trade in the United States and Other Countries, 1893-1899. Edited by Richard P. Rothwell. Vols. 2-8. New York and London, The Scientific Publishing Company, 1894-1900.

Handbuch der Ingenieurwissenschaften. Third Edition, Enlarged. 2 vols. Leipzig, Wilhelm Engelmann, 1901.

Lehrbuch der Meteorologie. Von Dr. Julius Hann. Leipzig, Chr. Herm. Tauchnitz, 1901.

The Universal Directory of Railway Officials, 1901. Compiled from Official Sources under the Direction of S. Richardson Bludstone. London, The Directory Publishing Company, Limited, 1901.

Centralblatt der Bauverwaltung (to complete set). 44 nos.

Transactions of the North of England Institute of Mining and Mechanical Engineers (to complete set). 13 vol.

SUMMARY OF ACCESSIONS.

January 8th to February 11th, 1902.

Donations (including 126 duplicates and 2 numbers completing volumes of periodicals).....	355
By purchase (including 44 numbers, completing volumes of periodicals)	66
Total.....	421

MEMBERSHIP.

ADDITIONS.

MEMBERS.

		Date of Membership.
ABBOTT, ARTHUR VAUGHAN, Room 209, Electrical Bldg., Cleveland, Ohio.....	Jun. M.	Jan. 5, 1881 Dec. 4, 1901
BUDGE, EDWARD BARNARD, Eng. in Chf., 1st Section, Chili State Railways (F. C. de E.), Estacion Bella Vista, Valparaiso, Chili.....	.....	Nov. 6, 1901
CHASE, CHARLES FRANCIS Chf. Eng., Berlin Constr. Co., 241 West Main St., New Britain, Conn.....	.....	Feb. 5, 1902
ELLIS, GEORGE EZRA, Signal Eng., Standard Signal Co., Troy, N. Y.....	.....	Dec. 4, 1901
HILDENBRAND, WILHELM 1 Broadway, New York City .	.....	Feb. 5, 1902
KADONO, CHOKURO, Eng. and Mgr., Okuro & Co., 53 New Broad St., London, E. C., England.....	.....	Jan. 8, 1902
SNOW, WILLIAM PLINY, 335 Lexington St., Auburndale, Mass.....	.....	Feb. 5, 1902

ASSOCIATE MEMBERS.

BRANCH, THOMAS PETTUS Jun. Prof., Georgia School of Technology, Atlanta, Ga...	Feb. 5, 1902
BURDEN, JAMES 3 Locust Ave., Troy, N. Y.....	Feb. 5, 1902
COWPER, JOHN WHITFIELD, Eng. and Supt., British Westinghouse Elec. & Mfg. Co., Ltd., Mersey Tunnel Ry. Impvmts., Birkenhead, England....	Jun. Assoc. M. June 21, 1894 Oct. 2, 1901
DU BOIS, JULIAN, Supt., Amsterdam St. R. R., Amsterdam, N. Y.....	Jan. 8, 1902
EDWARDS, FREDERICK, Instr. in Civ. Eng. and Math., Union College, Schenectady, N. Y.....	Jun. Assoc. M. Jan. 31, 1899 Feb. 5, 1902
FAY EDWARD BAYRD, 1000 Fullerton Bldg., St. Louis, Mo.....	Jan. 8, 1902
FLYNN, JOHN, JR., 83 Third St., Troy, N. Y.....	Jan. 8, 1902
HARWOOD, GEORGE ALEC, Chf. Draftsman, N. Y. C. & H. R. R. R., Room 521, Grand Central Station, New York City.....	Feb. 5, 1902

		Date of Membership.
HONE, FREDERIC DE PEYSTER, (Chambers & Hone), 60 New St., New York	Jun. Assoc. M.	April 4, 1899 Feb. 5, 1902
City.....		
MCGILVRAY, THOMAS FORRESTER, 209 First Natl. Bank Bldg., Duluth, Minn.....	Feb.	5, 1902
NEWTON, RALPH EELLS, P. O. Box 1098, Milwaukee, Wis.....	Jan.	8, 1902
POLLOCK, CLARENCE DU BOIS, Sen. Asst. Eng., Sewer Div., N. Y. Rapid Transit R. R. Comm., 13 Astor Pl., New York City.....	Jan.	8, 1902
REID, HOMER AUSTIN, 169½ Columbia Heights, Brooklyn, N. Y.....	Dec.	4, 1901
SEARS, ROBERT HUMPHREY, Care, Chf. Eng., East Indian Railway Office, Calcutta, India.....	Dec.	4, 1901
SMITH, WILLIAM STUART, 59 West Main St., Rochester, N. Y.....	Jan.	8, 1902
STRATTON, GEORGE EBER, U. S. Hydrographer, Room 1014, Barristers' Hall, Boston, Mass.....	Jan.	8, 1902
TILDEN, CHARLES JOSEPH, Asst. Eng., N. Y. Rapid Transit R. R. Comm., 1161 Amsterdam Ave., New York City	Jun. Assoc. M.	May 31, 1898 Feb. 5, 1902
TROUT, CHARLES ELIPHALET, Dept. of Docks and Ferries, Pier A, North River, New York City.....	Jun. Assoc. M.	Oct. 31, 1899 Jan. 8, 1902
WESTON, ROBERT SPURR, 14 Beacon St., Boston, Mass.....	Feb.	5, 1902
WILSON, PERCY HARTSHORNE, Secy. and Treas., River & Harbor Impvmt. Co., 801 Drexel Bldg., Philadelphia, Pa.....	Jun. Assoc. M.	Jan. 2, 1900 Feb. 5, 1902

ASSOCIATE.

BENNETT, LESLIE J., Secy., Buffalo Cement Co., Ltd., 110 Franklin St., Buffalo, N. Y.....	Jan.	7, 1902
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JUNIORS.

BURWELL, ROBERT LEMMON, New London, N. C.....	Dec.	3, 1901
FALK, MYRON SAMUEL, Tutor, Dept. Civ. Eng., Columbia Univ., Res. 63 East 74th St., New York City	Feb.	4, 1902
HAMMER, ROBERT HENRY, 4 Dean St., Brooklyn, N. Y	Jan.	7, 1902

		Date of Membership.
HARRINGTON, HARRY GARFIELD, 39 Pacific St., Newark, N. J.....		Jan. 7, 1902
PISTOR, GEORGE EMIL JOHN, 518 Broad St., Newark, N. J.....		Dec. 3, 1901
POTTS, CLYDE, U. S. Engrs.' Office, 33 Campan Bldg., Detroit, Mich....		Dec. 3, 1901
THOMPSON, WILFORD ASHFORD, Asst. Engr., Board of Public Works, 108 S. Conception St., Mobile, Ala		Oct. 1, 1901
UNDERWOOD, HOWARD WARREN, 811 NORTH 41st St., Philadelphia, Pa.		Dec. 3, 1901
WHITE, FRANK GEORGE, 316 West 115th St., New York City....		Dec. 3, 1901
WHITSON, ABRAHAM UNDERHILL, College Point, Long Island, N. Y.....		Jan. 7, 1902
WILCOCK, FREDERICK, Fiftieth St., near 9th Ave., Brooklyn, N. Y..		Jan. 7, 1902
WINCHESTER, PHILIP HAROLD, 20 Winslow St., Watertown, N. Y.....		Jan. 7, 1902

RESIGNATIONS.

	ASSOCIATE MEMBER.	Date of Resignations.
STOUT, EDMUND COFFIN.....		Feb. 4, 1902
JUNIOR.		
ROBINSON, ARTHUR WIET.....		Feb. 4, 1902

DEATHS.

LASSIG, MORITZ.....	Elected Member, April 2d, 1884; died Jan 7th, 1902.
REINHOLDT, KENNETH OAKE PLUMMER..	Elected Junior, Feb. 6th, 1894, Associate Member, October 7th, 1896; died Feb. 6th, 1902.
RUSSELL, NATHANIEL EDWARDS.....	Elected Member Oct. 3d, 1888; died Jan. 14th, 1902.
VAN SLOOTEN, WILLIAM	Elected Member, Nov. 3d, 1897; died Dec. 14th, 1901.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(January 8th to February 11th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal*, Assoc. Eng. Soc., 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings*, Eng. Club of Phila., 1122 Girard St., Philadelphia, Pa.
- (3) *Journal*, Franklin Inst., Philadelphia, Pa., 50c.
- (4) *Journal*, Western Soc. of Eng., Moadnock Block, Chicago, Ill.
- (5) *Transactions*, Can. Soc. C. E., Montreal, Que., Can.
- (6) *School of Mines Quarterly*, Columbia Univ., New York City, 50c.
- (7) *Technology Quarterly*, Mass. Inst. Tech., Boston, Mass., 75c.
- (8) *Stevens Institute Indicator*, Stevens Institute, Hoboken, N. J., 50c.
- (9) *Engineering Magazine*, New York City, 30c.
- (10) *Cassier's Magazine*, New York City, 25c.
- (11) *Engineering* (London), W. H. Wiley, New York City, 35c.
- (12) *The Engineer* (London), International News Co., New York City, 35c.
- (13) *Engineering News*, New York City, 15c.
- (14) *The Engineering Record*, New York City, 12c.
- (15) *Railroad Gazette*, New York City, 10c.
- (16) *Engineering and Mining Journal*, New York City, 15c.
- (17) *Street Railway Journal*, New York City, 35c.
- (18) *Railway and Engineering Review*, Chicago, Ill.
- (19) *Scientific American Supplement*, New York City, 10c.
- (20) *Iron Age*, New York City, 10c.
- (21) *Railway Engineer*, London, England.
- (22) *Iron and Coal Trades Review*, London, England.
- (23) *Butterlin*, American Iron and Steel Assoc., Philadelphia, Pa.
- (24) *American Gas Light Journal*, New York City, 10c.
- (25) *American Engineer*, New York City, 20c.
- (26) *Electrical Review*, London, England.
- (27) *Electrical World and Engineer*, New York City, 10c.
- (28) *Journal*, New England Water-Works Assoc., Boston, 75c.
- (29) *Journal*, Society of Arts, London, England.
- (30) *Annales des Travaux Publics de Belgique*, Brussels, Belgium.
- (31) *Annales de l'Assoc. des Ing. Sortis des Ecole Spéciales de Gand*, Brussels, Belgium.
- (32) *Mémoires et Compte Rendu des Travaux*, Soc. Ing. Civ. de France, Paris, France.
- (33) *Le Génie Civil*, Paris, France.
- (34) *Portefeuille Économique des Machines*, Paris, France.
- (35) *Nouvelles Annales de la Construction*, Paris, France.
- (36) *La Revue Technique*, Paris, France.
- (37) *Revue de Mécanique*, Paris, France.
- (38) *Revue Générale des Chemins de Fer et des Tramways*, Paris, France.
- (39) *Railway Master Mechanic*, Chicago, Ill.
- (40) *Railway Age*, Chicago, Ill., 10c.
- (41) *Modern Machinery*, Chicago, Ill., 10c.
- (42) *Transactions*, Am. Inst. Elec. Engrs., New York City, 50c.
- (43) *Annales des Ponts et Chaussées*, Paris, France.
- (44) *Journal*, Military Service Institution, Governor's Island, New York Harbor, 75c.
- (45) *Mines and Minerals*, Scranton, Pa., 20c.
- (46) *Scientific American*, New York City, 10c.
- (47) *Mechanical Engineer*, Manchester, England.
- (48) *Proceedings*, Eng. Soc. W. Pa., 410 Penn Ave., Pittsburg, Pa., 50c.
- (49) *Transactions*, Mining Institute of Scotland, London and Newcastle-upon-Tyne.
- (50) *Municipal Engineering*, Indianapolis, Ind., 25c.
- (51) *Proceedings*, Western Railway Club, 225 Dearborn St., Chicago, Ill., 25c.
- (52) *American Manufacturer and Iron World*, 59 Ninth St., Pittsburg, Pa.
- (53) *Minutes of Proceedings*, Inst. C. E., London, England.
- (54) *Power*, New York City, 10c.
- (55) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.
- (56) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.

Bridge.

- Summer Street Viaduct, South Boston.* Herman K. Higgins. (1) Dec.
 A Three-Hinged Concrete Arch Bridge over the Danube at Ehingen.* (13) Jan. 9.
 The Condition of the Brooklyn Bridge. (15) Jan. 10.
 The Railway Bridge over the Godavari River at Rajahmundry, on the East Coast Railway, India.* (11) Jan. 10.
 The Erection of the Portage du Fort Bridge.* (14) Jan. 11.
 A New Scherzer Rolling Lift Bridge at Cleveland.* (15) Jan. 17; (18) Jan. 18.
 Erection of Girder Spans on the West Virginia Short Line R. R.* (14) Jan. 18.
 Arched Viaduct over the Seine, Paris. (11) Jan. 31.
 An Eventful Bridge History (Johnsonville, Tenn.). Hunter McDonald. (15) Feb. 7.
 Reinforcing an Undermined Bridge Pier. (14) Feb. 8.
 Note sur le "Pyrmont Bridge," à Sydney.* Ad. Guillemin. (30) Dec.
 Le nouveau pont de Luxembourg.* A. Dutreux. (33) Jan. 18.

Electrical.

- The Induction Motor and the Rotary Converter and Their Relation to the Transmission System. Chas. F. Scott. (42) Dec.
 The Control of High Potential Systems of Large Power.* E. W. Rice, Jr. (42) Dec.
 Street Illumination and Units of Light.* W. D'A. Ryan. (42) Dec.
 The Incandescent Lamp of To-day. John W. Howell. (42) Dec.
 A Note on an Acetylene-in-Oxygen Flame.* Clayton H. Sharp. (42) Dec.
 Electric Gas Lamps and Gas Electrical Resistance Phenomena. Peter Cooper Hewitt. (42) Dec.
 The Central Exchange of the London Post Office Telephones.* (26) Serial beginning Dec. 6, ending Jan. 3.
 Three-Phase Distribution for Power and Lighting.* Sydney Woodfield. (26) Jan. 3.
 The Waterside Station of the New York Edison Company.* (27) Serial beginning Jan. 4, ending Feb. 1.
 Aluminum: Its Properties and Use. W. Murray Morrison. (47) Jan. 4.
 Sparkless Commutation with Fixed Brushes.* Claude W. Hill. (26) Jan. 10.
 Applications and Uses of Arc Lamps.* (26) Serial beginning Jan. 10, ending Jan. 17.
 Complete Commercial Test of Polyphase Induction Motors Using One Wattmeter and One Voltmeter.* A. S. McAllister. (27) Jan. 11.
 Methods of Eliminating Corrections for the Leads, etc., in Cable Testing.* H. Savage. (26) Serial beginning Jan. 17, ending Jan. 24.
 The Corbin Process and Cell for the Electrolytic Production of Chlorates.* John B. C. Kershaw. (26) Jan. 17.
 The Manufactures of Royce, Limited.* (26) Jan. 17.
 Some Experiments with Wireless Telegraphy.* (46) Jan. 18.
 Large Generators for Bolton.* (26) Jan. 24.
 Dynamo-Testing at the English Electric Manufacturing Company's Works, Preston.* (11) Jan. 24.
 Electrical Machinery in the Power Station and Substations of the Manhattan Ry. Co.* (13) Jan. 30.
 Electric Appliances in Ship-Building Yards.* Sydney F. Walker. (9) Feb.
 The Economy of Isolated Electric Plants.* Isaac D. Parsons. (9) Feb.
 Dangers from Electric Trolley Wires and Other Aerial Conductors; How They are Guarded Against in Great Britain.* Andrew Jamieson, M. Inst. C. E. (10) Feb.
 The New Central Station of The Citizens' Light and Power Co., Rochester, N. Y.* (64) Feb.
 The New Power Plant of the Citizens' Company of Rochester, N. Y.* (27) Feb. 1.
 The Electric Light and Power Plant of the New United States Mint, Philadelphia.* Clayton W. Pike. (27) Feb. 1.
 Electric Equipment of Railway Docks, Middlesborough, England.* (27) Feb. 1.
 The Electric Installation of the Natural Food Factory at Niagara Falls, N. Y.* Arthur B. Weeks. (27) Feb. 8.
 Omnibus automobile électrique de la Compagnie de Traction par trolley automoteur.* (34) Jan.

Marine.

- German Cruiser *König Wilhelm Ersatz*.* (12) Dec. 27.
 A New Dry Dock at Baltimore, Md.* (13) Jan. 9.
 The Japanese Battleship *Mikasa*.* (12) Jan. 10.
 New Japanese Cruisers *Nisitaka* and *Tsushima*. (12) Jan. 24.
 Tubes with Sides and without, in Ship Resistance; An Example from Lord Kelvin.* Marston Niles. (19) Feb. 1.
 Contribution à la Recherche de l'Insubmersibilité des Grands Navires d'Acier.* E. Duchesne. (32) Nov.
 La Perte du Contre-Torpilleur Anglais *Cobra*. (33) Dec. 28.

Mechanical.

- English, American and Continental Steam Engineering.* Philip Dawson. (9) Serial beginning Nov., ending Feb.
 The Present Status of the Question of a Standard of Light. Clayton H. Sharp. (42) Dec.

Mechanical—(Continued).

- Smoke Abatement in St. Louis.* William H. Bryan. (1) Dec.
 The Efficiency of Compound Centrifugal Pumps.* F. G. Hesse. (1) Dec.
 On the Speed of Machine-Shop Tools. J. W. E. Littledale. (11) Dec. 27.
 English and French Practice in the Manufacture of Cast-Iron Pipes. Stephen H. Terry,
 M. Inst. C. E., and A. G. Cleake. (47) Dec. 28.
 Comparison of Cost of Operating an Iron Smelting Plant by Gas Engines Using Waste
 Blast Furnace Gas, and by Gas Fired Boilers and Steam Engines. William M.
 Chatard, Henry J. Botchford, and Emley M. Holecombe. (8) Jan.
 Machinery at the St. Louis Exposition.* (41) Jan.
 Thermal Emissivity in High-Pressure Gases.* (11) Jan. 3.
 The De Laval Steam Turbine.* (20) Jan. 9.
 Report of the Committee on Standard Pipe Unions of the American Society of Mechanical Engineers.* (20) Jan. 9.
 Bickford's New Radial Drill.* (62) Jan. 9.
 French Spirit Motors. (11) Jan. 10.
 A Silent Cham Gear.* J. O. Nixon. (19) Jan. 11.
 Gas from Oil: Process as Conducted on the Pacific Coast.* (24) Jan. 13.
 A New Crank Pin Turning Machine.* (20) Jan. 16.
 Modern Plants for the Manufacture of Hoops and Merchant Bars.* Theo. J. Vollkommer.
 (20) Jan. 16.
 The Design and Construction of Flywheels for Slow-Speed Engines for Electric Lighting and Traction Purposes.* A. Marshall Downie. (11) Serial beginning Jan. 17, ending Jan. 24.
 Acetylene for Gas Engines. (12) Jan. 17.
 High-Speed Steam Engines. John Davidson. (12) Serial beginning Jan. 3, ending Jan. 17.
 Combustion in Gas Producers and Benches. Robert W. Prosser. (24) Serial beginning Jan. 20, ending Jan. 27.
 A New Machine for Ore Unloading.* (20) Jan. 23.
 The Sellers 28-Foot Boring and Turning Mill.* (20) Jan. 23.
 The Lindsay Reversing Gear for Rolling Mills.* (20) Jan. 23.
 Modern Machine Methods.* H. F. L. Orentt. (Paper read before the Institution of Mechanical Engineers.) (11) also (12) Serial beginning Jan. 24, ending Jan. 31.
 A Successful Bag-Conveying System.* (13) Jan. 30.
 Comparative Tests of Coal and Crude Oil as Fuel.* (13) Jan. 30.
 The Bureau of Printing and Engraving.* Waldon Fawcett. (62) Jan. 30.
 Hoisting Machinery.* Joseph Horner. (10) Feb.
 American Traction Engine Notes.* Charles O. Heggen. (10) Feb.
 Fuel Value of Texas Oil.* J. E. Denton. (64) Feb.
 Feed Water Heaters in Condensing Plants. C. G. Robbins. (64) Feb.
 Lessons from the Automobile Endurance Contest. R. H. Thurston. (19) Feb. 1.
 Power Plant of the Booth Cold Storage Warehouse, Chicago.* (14) Feb. 1.
 Machine Tools in Ship Yards.* Waldon Fawcett. (41) Feb. 1.
 Steam Turbines.* F. J. Warburton. (47) Feb. 1.
 Tests of Beaumont Oil as Fuel.* (16) Feb. 1.
 Gas Distribution at Leeds, England.* (Abstract from the *Gas World*.) (24) Feb. 3.
 Gas and Gasoline Engine Ignition. Albert Stritmatter. (62) Feb. 6.
 The Cambria Steel Company's New Works.* (20) Feb. 6.
 Natural Gas and Other Fuels—A Comparison.* (15) Feb. 7.
 The Bursting of Small Cast-Iron Fly-Wheels.* Charles H. Benjamin. (19) Feb. 8.
 Rope Transmission of Power. E. C. DeWolfe. (Extract from paper read before Indiana Eng. Soc.) (14) Feb. 8.
 Metallic Joints for Steam, Air and Water: Also Quick-Opening Valve Suitable for Gas Works, etc.* (24) Feb. 10.
 Concours Général des Moteurs et Automobiles à Alcool. M. Ringelmann. (32) Dec.
 Les Progrès de la Navigation Aérienne et les Expériences de M. Santos-Dumont. M. Armengaud, Jeune. (32) Dec.
 Machine Compound demi-fixe, à vapeur surchauffée, système. R. Wolf. (34) Jan.
- Metallurgical.**
 Crucible Steel: Its Manufacture and Treatment. David Flather. (22) Serial beginning Dec. 20, ending Dec. 27.
 Concentration Practice in Southeast Missouri.* R. B. Brinsmade. (45) Jan.
 The Microscopical Examination of the Alloys of Copper and Tin.* William Campbell.
 (11) Serial beginning Jan. 3, ending Jan. 17.
 A Modern Foundry; a Good Example of Design and Equipment.* Albert L. Rohrer.
 (10) Feb.
 Lead Smelting in Southeast Missouri.* R. B. Brinsmade. (45) Feb.
- Military.**
 Repairing Worn-Out Guns on Service.* Colonel R. Bannantine-Allason. (12) Jan. 10.
- Mining.**
 Mining Operations in Atlin, B. C.: A Description of Some of the Placers and Hydraulic Plants which are being Installed.* R. Lind Watson. (45) Serial beginning Dec., ending Jan.

Mining—(Continued).

- Electric Mine Haulage.* W. B. Clarke. (45) Jan.
 Western Australia's Mining Industries.* H. L. Geissel. (16) Jan. 4.
 The Eisenbeis Pick Mining Machine. (22) Jan. 10.
 A Mine-Pumping Plant with Electrically-Driven Centrifugal Pumps.* (13) Jan. 23.
 Opportunities for Improvement in Mica Mining. George W. Colles. (9) Feb.
 New Plant at Shaft No. 5 of the Spring Valley Coal Co., at Spring Valley, Ill.* A. Dinsmoor. (45) Feb.
 Mechanical Engineering, as Applied to Coal Mines, and Its Relation to the Economical and Successful Operation of the Same.* Wm. Glyde Wilkins. (Paper read before Western Penn. Central Min. Inst.) (45) Feb.
 White Horse Mining District, Yukon Territory.* William M. Brewer. (16) Feb. 1.
 The Mining District of Guanajuato, Mexico.* (16) Feb. 8.

Miscellaneous.

- Engineering and Industrial Enterprises at Sault Ste. Marie.* (13) Jan. 9.

Municipal.

- Making Roads by Machinery.* Waldon Fawcett. (46) Jan. 11.
 The State Roads of Massachusetts. Albert S. Merrill. (14) Jan. 11.
 Bituminous Macadam Pavement. (14) Jan. 25.
 Proposed Changes in the New York Asphalt Paving Specifications. (13) Feb. 6.
 Criticisms of the New York Asphalt Pavement Specifications. A. W. Dow. (13) Feb. 6.
 Some Economic Features in Municipal Engineering. C. S. Burns. Assoc. M. Am. Soc. C. E. (14) Feb. 8.

Railroad.

- Locomotive Rating—Adjusted Tonnage Method.* D. F. Crawford. (61) Dec. 17.
 The Trans-Australian Railway Scheme. Stafford Ransome, M. Inst. C. E. (12) Dec. 27.
 The "Reid" 10-Coupled Tank Engines; Natal Government Railways.* (21) Jan.
 The Building of a Modern Locomotive.* (19) Serial beginning Jan. 4, ending Jan. 11.
 Bogie Express Passenger Engine for the South Eastern and Chatham Railway.* (47) Jan. 4.
 Wide Firebox Atlantic Type Locomotive.* (40) Jan. 10.
 Central of Georgia Box Cars.* (40) Jan. 10.
 The Proper Utilization of Motive Power. (15) Jan. 10.
 Lignite-Burning Consolidation Locomotive—Bismarck, Washburn & Great Falls.* (15) Jan. 10.
 Four-Cylinder Tandem Compound Decapod Locomotive—Largest Engine Yet Built.* (18) Jan. 11.
 A New Method of Building Embankments.* (13) Jan. 16.
 Interlocking and Signal Work on the Union Pacific.* (40) Jan. 17.
 The Investigation of the Park Avenue Tunnel Disaster. (13) Jan. 23.
 Six-Coupled Express Locomotive, Eastern Railway of France.* (12) Jan. 24.
 The New York Central Accident—Electricity—Protection by Signals.* S. S. Neff. (15) Jan. 24.
 Some Factors Affecting the Power of Locomotives.* (15) Jan. 24.
 Oil Burning Locomotives on the Southern Pacific.* (15) Jan. 24.
 Passenger Mogul for the New York, Ontario and Western.* (40) Jan. 24.
 Comments on the Electrical Equipment of the New York Central Tunnel. (17) Jan. 25.
 Proposed Solution of the New York Central Terminal Problem.* (26) Jan. 25.
 The Langen Suspended Railway of Barmen-Vohwinkel-Elberfeld.* Prof. Dolezalek. (46) Jan. 25.

- Investigation of the Park Ave. Tunnel Collision. (13) Jan. 30.
 Flexibility in Car Coupling Attachments.* (13) Jan. 30.
 New York Central Underground Passenger Loop.* (40) Jan. 31.
 Tandem Compound Decapod for the Santa Fé.* (40) Jan. 31.
 New Construction of Steel Center Sills and Bolsters; Chicago, Milwaukee and St. Paul Railway.* (25) Feb.
 The Nilgiri Mountain Railway; the First Abt Rack Railway in India.* Walter James Weightman, M. Inst. C. E. (10) Feb.
 Decapod Tandem Compound Locomotive; Atchison, Topeka and Santa Fé Railway.* (25) Feb.
 Box car, 80,000 Pounds Capacity; Chesapeake and Ohio Railway.* (25) Feb.
 New Locomotive Shops; Central Railroad of New Jersey, at Elizabethport, N. J.* (25) Feb.
 Compound Consolidation Passenger Locomotive; Colorado Midland Railway. (25) Feb.
 Chautauqua Type Locomotive, Central Railroad of New Jersey.* (39) Feb.
 Track Elevation on the New York, New Haven and Hartford R. R. at Boston, Mass.* (18) Feb. 1.
 Construction Work on the Aurora, Elgin and Chicago Railway.* (17) Feb. 1.
 Steam Motor Cars for Railway Service.* (13) Feb. 6.
 A New Device for Displaying Train Order Signals.* (40) Feb. 7.
 Concrete Structures for Railways. W. A. Rogers, M. Am. Soc. C. E. (Abstract of paper presented to the Ill. Soc. of Engrs. and Surveyors.) (14) Feb. 8.
 High-Speed German Railway at Zossen.* Frank C. Perkins. (46) Feb. 8.
 The Proper Utilization of Motive Power.* (18) Feb. 8.

Railroad—(Continued).

- Train Order Locking Device on Block Signals.* (18) Feb. 8.
 60,000-lb. Capacity Stock Car, Illinois Central R. R.* (18) Feb. 8.
 Les Chemins de Fer aux Indes Néerlandaises (Java et Sumatra). Auguste Moreau. (32) Dec.
 La Construction des Locomotives aux États-Unis.* (36) Dec. 25.
 Le Chemin de Fer Suspendu de Barmen-Elberfeld-Vohwinkel (Allemagne).* (33) Dec. 28.
 Contrôle électro-pneumatique de chemins de fer, système Westinghouse.* (36) Jan. 10.
 Nouvelles Formules de la Résistance des Trains. (33) Jan. 11.
 Prolongement de la ligne d'Orléans dans Paris; gare du quai d'Orsay.* A. Dumas. (33) Jan. 25.

Railroad, Street.

- Portsmouth Electric Tramways.* (26) Jan. 10.
 Methods of Safety for the Overhead Trolley System. Edward Manville. (47) Jan. 11.
 The Manhattan Elevated Railroad.* (17) Jan. 11.
 Progress on the East Boston Subway and Tunnel.* (18) Jan. 11.
 The Power Station of the Salford Municipal Tramways.* (14) Jan. 11.
 Opening of the Power Station of the Manhattan Elevated Railway.* (46) Jan. 11.
 Work on the East Boston Tunnel. (14) Jan. 11.
 The Electric Equipment of the Manhattan Elevated.* (15) Jan. 17; (27) Serial beginning Jan. 11, ending Jan. 25.
 Methods of Work on the East Boston Tunnel Extension of the Boston Subway.* (13) Jan. 23.
 Brighton Corporation Electric Tramways.* (26) Jan. 24.
 Current Practice in Electric Railway Construction and Operation.* (13) Jan. 30.
 Electric Machinery in the Power Station and Substations of the Manhattan Ry. Co.* (13) Jan. 30.
 The Effect of a Surface Explosion of Dynamite.* (14) Feb. 1.
 Mining Methods in the New York Subway.* D. H. Newland. (16) Feb. 1.
 Electric Car Equipments and Their Maintenance. A. W. Wigram. (47) Feb. 1.
 New Power Station of the Manhattan Railway Company.* (17) Feb. 1.
 The Salford Corporation Tramways.* (17) Feb. 1.
 The Hartford & Springfield Street Railway.* (17) Feb. 1.
 Construction of the New Car House of the Chicago City Railway.* (17) Feb. 8.
 Traction Électrique des Tramways, Système Barbillon et Griffisch, par Distributeur Automobile à Échappement.* J. Reyval. (36) Dec. 25.
 Le Chemin de Fer Électrique à Voie Normale de Berthoud à Thoune (Suisse).* (33) Jan. 11.

Sanitary.

- Experts' Report on Sewage Disposal for the Lower Passaic Valley. (13) Jan. 9.
 Ventilation of a Telephone Exchange.* (14) Jan. 11.
 Experimental Septic Tanks at Ithaca, N. Y.* (14) Jan. 11.
 Lighting, Heating and Ventilation in the Nassau County Court House, Mineola, N. Y.* (14) Jan. 18.
 Garbage Collection, Removal, and Final Disposal at Milwaukee, Wis.* (13) Jan. 23.
 The Sewerage and Sewage Disposal of Burton-upon-Trent. Jonah Walker Smith. (14) Jan. 25.
 The Purification of Sewage by Septic Tanks and Various Supplemental Processes. W. S. Shields. (Abstract of paper read before the Ill. Soc. of Engrs. and Surveyors.) (13) Jan. 30; (14) Feb. 8.

- Concrete Sewer Construction at Coldwater, Mich.* Harry V. Gifford. Jun. Am. Soc. C. E. (Abstract of paper read before the Mich. Eng. Soc.) (13) Jan. 30.
 Plumbing in the Hotel Wellington, New York.* (14) Feb. 1.

Structural.

- The Inspection and Testing of Cements. Richard L. Humphrey. (3) Serial beginning Dec., ending Feb.
 Some Features of the Design and Construction of High Buildings.* William Copeland Furber. (2) Jan.
 Standardisation of Tests for Iron and Steel. W. H. Farnell. (47) Serial beginning Jan. 4, ending Jan. 11.
 Shocks in Pile Driving. D. B. Dixon. (62) Jan. 9.
 Some Comparisons of Standard Specifications for Testing Portland Cement. E. Duryea. (13) Jan. 9.
 Structural Features of the Frick Building, Pittsburgh.* (14) Jan. 11.
 The Steel Framing of the General Electric Foundry, Schenectady.* (14) Jan. 18.
 The Foundation of the Port Richmond Grain Elevator.* (14) Jan. 18.
 Slag Cement Manufacture in Alabama. Edwin C. Eckel, Assoc. Am. Soc. C. E. (13) Jan. 23.
 Tests and Constitution of Portland Cement. A. D. Elbers. (62) Jan. 30.
 A Modern Foundry; a Good Example of Design and Equipment.* Albert L. Rohrer. (10) Feb.
 Practical Applications of Reinforced Concrete.* Jacques Boyer. (9) Feb.

Structural—(Continued).

- Structural Steel Details of a Two-Story Boiler House.* (14) Feb. 1.
 Steelwork in the Prudential Building, Newark.* (14) Feb. 1.
 The Cambria Steel Company's New Works.* (20) Feb. 6.
 Notes sur le Troisième Congrès de l'Association Internationale pour l'Essai des Matériaux de Construction, tenu à Budapest, du 9 au 14 Septembre, 1901. (32) Nov.
 Note Relative aux Assemblages par Rivets dans les Pièces Fléchies. E. Cuvelier. (30) Dec.

Water Supply.

- Chief Engineer Hill's Report on Proposed Changes in the New Croton Dam and Jerome Park Reservoir.* (13) Jan. 16.
 A Special Report on Changes in the Jerome Park Reservoir. (13) Jan. 16.
 The Largest Water Softening Plant in the World.* (22) Jan. 17.
 The Pittsburg Water Purification Works.* (14) Jan. 25.
 Contamination of the Water Supply of the City of Hamilton, Ohio.* John Lorenz. (60) Feb.
 Remarks on the Recent Failures of Masonry Dams in the South.* B. H. Hardaway. (13) Feb. 6.
 Water Cost and Water Waste.* A. L. Holmes. (Abstract of a paper read before the Mich. Eng. Soc.) (13) Feb. 6.
 Further Reports on the Jerome Park Reservoir. (13) Feb. 6.
 The Shawinigan Falls Electrical Development.* (27) Feb. 8.
 An Unusual Method of Constructing Condensing Water Tunnels.* (14) Feb. 8.
 Les Filtres à Sable de la Distribution d'Eau d'Albany (États-Unis).* (33) Serial beginning Dec. 28, ending Jan. 4.

Waterways.

- Harbor Lighterage and Transportation. H. L. Joyce. (65) Dec.
 Recent Improvements Effectuated in the Navigable Condition of the Sulina Branch and Outlet of the Danube. C. M. Kühl. (11) Dec. 27.
 Electric Ship's Lift at Henrichenburg (Dortmund-Ems Canal).* (12) Jan. 3.
 The St. Francis Levee Districts of Arkansas and Missouri.* Harry N. Pharr. (13) Jan. 9.
 Zeebrugge Harbour Works.* J. Nyssens Hart and L. Van Gansberghe. (11) Jan. 10.
 A Comparison of the Panama and Nicaragua Canal Routes. (46) Jan. 18.
 The Isthmian Canal Commission's Explanation of Its Choice of Dimensions for the Isthmian Canal.* (14) Jan. 18.
 Isthmian Canal Controversy.* (10) Jan. 18.
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 Supplementary Report of Panama Canal Commission in Favor of Panama. (19) Feb. 1.
 The Isthmian Canal. (15) Feb. 7.
 Interstate Riparian Water Rights. (14) Feb. 8.
 La Déivation de la Meuse vers le Hollandschdiep; Rapport de Mission.* F. Zanen et J. Mélotte. (30) Dec.; (31) Vol. xxiv, Pt. 4.
 Les Nouveaux Ports du Haut-Rhin. J. Cartuyvels. (30) Dec.
 La Correction du Rhin Supérieure. J. Cartuyvels. (30) Dec.
 Panama ou Nicaragua. (36) Dec. 25.
 Drague Marine Porteuse à Sucction et à Refoulement des Établissements L. Smit et Zoon.* (33) Jan. 4.

* Illustrated.

PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS.
(INSTITUTED 1852.)

VOL. XXVIII. No. 3.
MARCH, 1902.

Edited by the Secretary, under the direction of the Committee on Publications.

Reprints from this publication, which is copyrighted, may be made on condition that the full title of Paper, name of Author, page reference, and date of presentation to the Society, are given.

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Papers and DiscussionsPages 189 to 324.

NEW YORK 1902.

Entered according to Act of Congress, by the AMERICAN SOCIETY OF CIVIL ENGINEERS
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American Society of Civil Engineers.

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GEORGE H. BENZENBERG, JOHN R. FREEMAN,

Secretary, CHARLES WARREN HUNT.

Treasurer, JOSEPH M. KNAP.

Directors.

Term expires January, 1903: *Term expires January, 1904:* *Term expires January, 1905:*

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WILLIAM H. KENNEDY, FRANK C. OSBORN. JAMES L. FRAZIER.

Assistant Secretary, T. J. McMINN.

Standing Committees.

THE PRESIDENT OF THE SOCIETY IS *ex-officio* MEMBER OF ALL COMMITTEES.

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G. H. BENZENBERG,
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RICHARD S. BUCK,
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On Library:

HENRY S. HAINES,
CHARLES C. SCHNEIDER,
MORDECAI T. ENDICOTT,
EMIL KUICHLING,
CHARLES WARREN HUNT.

Special Committees.

ON ANALYSIS OF IRON AND STEEL:—Sub-Committee of the American Society of Civil Engineers (of the International Committee on Standards for the Analysis of Iron and Steel, of which Prof. J. W. Langley is Chairman)—Charles B. Dudley, William Metcalf, Thomas Rodd.

ON UNITS OF MEASUREMENT:—George M. Bond, William M. Black, R. E. McMath, Charles B. Dudley, Alexander C. Humphreys.

ON UNIFORM TESTS OF CEMENT:—George S. Webster, George F. Swain, Alfred Noble, W. B. W. Howe, Louis C. Sabin, S. B. Newberry, Clifford Richardson, Richard L. Humphrey, F. H. Lewis.

The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays Fourth of July, Thanksgiving Day and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK

TELEPHONE NUMBER, - - 533 Columbus.
CABLE ADDRESS, - - "Ceas, New York."

AMERICAN SOCIETY OF CIVIL ENGINEERS,
INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

March 5th, 1902.—The meeting was called to order at 8.40 p. m., Joseph M. Knap, Treasurer, Am. Soc. C. E., in the chair; Charles Warren Hunt, Secretary; and present, also, 110 members and 11 visitors.

The minutes of the meetings of February 5th and 19th were approved as printed in the *Proceedings* for February, 1902.

Messrs. Julian Thornley and William Fitch Smith were appointed tellers to canvass the vote on the proposed amendment to the Constitution.

George S. Morison, Past-President, Am. Soc. C. E., presented his paper entitled "The Bohio Dam," illustrating it with lantern slides. The paper was supplemented by F. P. Stearns, M. Am. Soc. C. E., who described in detail the North Dike of the Wachusett Reservoir,

also using lantern slides. The paper was further discussed by Messrs. Allen Hazen, Edward P. North, Boyd Ehle, Theodore Paschke and the author. The Secretary presented a written discussion from William H. Burr, M. Am. Soc. C. E., and announced that he had received others from Messrs. A. G. Menocal, H. N. Pharr, Edwin Duryea, Jr., and C. A. Sundstrom. Owing to the lateness of the hour, these discussions were not read.

The tellers appointed to canvass the ballots on the proposed amendment to the Constitution, changing the method of election of members,* reported as follows:

Total number of ballots received.....	604
Without signature.....	2
Not entitled to vote.....	1
Defective (not filled out).....	1
	— 4
Total votes counted and found correct.....	600
In favor of the amendment (yes).....	343
Against the amendment (no).....	257
	— 600

The Chairman announced the proposed amendment lost, as the Constitution (Sec. 5, Art. IX) provides that an affirmative vote of two-thirds of all ballots cast shall be necessary to the adoption of any amendment.

Ballots for membership were canvassed and the following candidates were elected:

AS MEMBERS.

CHARLES ANTHONY, Jr., Buenos Aires, Argentine Republic.
 WENDELL PHILLIPS BROWN, Cleveland, Ohio.
 EMIL DIEBITSCH, New York City.
 ELSTNER FISHER, Hamilton, Ont., Canada.
 WILLIAM GERIG, Memphis, Tenn.
 ROBERT VAN ARSDALE NORRIS, Wilkesbarre, Pa.
 COMMODORE PERRY RUPLE, Cleveland, Ohio.

AS ASSOCIATE MEMBERS.

CHARLES WILLIAM BANCE, Jersey City, N. J.
 WILLIAM GEORGE BRENNKE, St. Louis, Mo.
 CLARENCE AUSTIN CRANE, New York City.
 CHARLES DERLETH, Jr., New York City.
 JAMES HAYWARD HARLOW, Jr., Pittsburg, Pa.
 JOSEPH FREDERICK HASSKARL, Philadelphia, Pa.
 WALTER LUMAN LAWTON, Albany, N. Y.

* See *Proceedings*, Vol. xxviii, p. 35.

CHARLES GILLINGHAM MOORE, Cleveland, Ohio.
WILLIAM ELTON MOTT, Ithaca, N. Y.
HERSEY MUNROE, Washington, D. C.
JOHN MARBLE RACE, Santiago de Cuba, Cuba.
LEWIS DANIEL RIGHTS, East Berlin, Conn.
MARSHALL POPE ROBERTSON, New Orleans, La.
GEORGE ROMMEL, Jr., Lewes, Del.
WARREN BERTRAM TRAVELL, East Orange, N. J.

The Secretary announced the election of the following candidates by the Board of Direction on March 4th, 1902:

As ASSOCIATE.

GIFFORD PINCHOT, Washington, D. C.

As JUNIORS.

CLINTON TALCOTT BISSELL, Brooklyn, N. Y.
GEORGE WILLIAM LEE, Vilas, Pa.

Adjourned.

March 19th, 1902.—The meeting was called to order at 9.45 p. m., Alfred Noble in the chair; Charles Warren Hunt, Secretary; and present, also, 67 members and 10 guests.

A paper entitled "Thermo-Electric Measurement of Stress," by C. A. P. Turner, M. Am. Soc. C. E., was presented by the author.

The Secretary announced the death of CHARLES EDWARD HAMLIN, elected Associate January 2d, 1894; died January 20th, 1902.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

March 4th, 1902.—8.30 p. m.—Vice-President Schneider in the Chair; Charles Warren Hunt, Secretary; and present, also, Messrs. Buck, Croes, Knap, Kuichling, Pegram, O'Rourke, Seaman and Swain.

Action was taken in the matter of the appointment of a Special Committee on Rail Sections.

The following Local Committee of Arrangements for the Annual Convention, to be held at Washington, May 20th to 24th, 1902, was appointed:

GEORGE W. MELVILLE,	<i>Chairman;</i>
JOHN BIDDLE,	C. B. HUNT,
WILLIAM M. BLACK,	D. E. MCCOMB,
D. S. CARLL,	ALEXANDER MACKENZIE,
BERNARD R. GREEN,	ALEXANDER M. MILLER,
H. M. WILSON.	

The appointment, by the President, of the following Committee to report a Proposed Amendment to the Constitution, in regard to the method of election of members, and also in regard to the raising of the standard of qualification for admission to the Society, was announced:

H. G. PROUT,	<i>Chairman;</i>	Representing District No. 1.
H. A. CARSON,	"	" No. 2.
G. S. WILLIAMS,	"	" No. 3.
THOMAS H. JOHNSON,	"	" No. 4.
E. J. BLAKE,	"	" No. 5.
DANIEL BONTECOU,	"	" No. 6.
JAMES D. SCHUYLER,	"	" No. 7.

One candidate for Associate and two for Junior were elected.*

Action was taken in regard to members in arrears for dues.

Applications were considered and other routine business transacted.

Adjourned.

* See page 99.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, April 2d, 1902.—8.30 p. m.—At this meeting ballots for membership will be canvassed, and two papers will be presented; one by Marsden Manson, M. Am. Soc. C. E., entitled "A Brief History of Road Conditions and Legislation in California," and the other by Charles C. Wentworth, M. Am. Soc. C. E., on "Line and Surface for Railway Curves."

These papers were printed in the *Proceedings* for February, 1902.

Wednesday, April 16th, 1902.—8.30 p. m.—At this meeting two papers will be presented for discussion, as follows: "Is It Unprofessional for an Engineer to be a Patentee?" by Archibald R. Eldridge, M. Am. Soc. C. E.; and "The Stiffening System of Long-Span Suspension Bridges for Railway Trains," by Joseph Mayer, M. Am. Soc. C. E.

These papers were printed in the *Proceedings* for February, 1902.

Wednesday, May 7th, 1902.—8.30 p. m.—At this meeting ballots for membership will be canvassed, and a paper by George S. Webster and Samuel Tobias Wagner, Members, Am. Soc. C. E., entitled "The Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa.," will be presented for discussion.

This paper is printed in this number of *Proceedings*.

ADDITIONAL PAPER.

Attention is called to the paper entitled "Stresses in Columns Subject to Combined Axial and Transverse Loading," by Charles Worthington, M. Am. Soc. C. E., published in this number of *Proceedings*. This paper will not be presented for discussion at any meeting, but written communications on the subject are invited for publication, and its discussion may be called up by any member at any future meeting of the Society.

ANNUAL CONVENTION OF 1902.

The Thirty-fourth Annual Convention of the Society will be held at Washington, D. C., beginning on Tuesday, May 20th, 1902.

The general arrangements for the Convention are in the hands of a Committee of the Board of Direction, consisting of the following:

MORDECAI T. ENDICOTT,

GEORGE H. PEGRAM,

CHAS. WARREN HUNT.

The following Local Committee of Arrangements has been appointed by the Board of Direction:

GEORGE W. MELVILLE, *Chairman*:

JOHN BIDDLE,

C. B. HUNT,

WILLIAM M. BLACK,

D. E. McCOMB,

D. S. CARLL,

ALEXANDER MACKENZIE,

BERNARD R. GREEN,

ALEXANDER M. MILLER,

H. M. WILSON.

TOPICS FOR DISCUSSION AT THE ANNUAL CONVENTION.

No suggestions having been received in response to the request published in the February *Proceedings* under this head, it is here repeated in the hope that members will take some interest in this important matter.

It will be remembered that at the last three Conventions no formal papers have been presented, but that in their stead topics of general interest have been presented for discussion. The resulting attendance and interest in Convention meetings has shown the wisdom of the change, and the Committee on Publications will be glad to have members suggest topics suitable for discussion.

The following list, of the subjects which have already been discussed at Conventions, is here printed, in order to give some idea of the kind of subjects desired:

LIST OF SUBJECTS PRESENTED FOR DISCUSSION AT THE LAST THREE ANNUAL CONVENTIONS.

- “ Should the use of the method of Wheel Concentrations be discontinued in determining the Stresses in Railroad Bridges?
- “ In view of present knowledge of the Effect of Repeated Applications of Load, should Fatigue Formulas be used in Bridge Design?
- “ (a) Should Stream Contamination by the Sewage of Cities be absolutely prohibited by law?
- “ (b) Should the Purification of the Sewage of Cities be compulsory, and is this feasible for Large Cities?
- “ (c) Is Filtration the coming solution of the Pure-Water Question for Cities?
- “ What is the Proper Friction Coefficient for use in the design of Riveted Steel Pipe?
- “ What are the economic conditions under which Electricity may be profitably substituted for Steam in the operation of Branch Railroad Lines, and what are the engineering requirements to be considered in such substitution?
- “ What is the present development of the so-called Telferage System for moving either Freight or Passengers? What are the conditions under which that System is preferable to movement by Rail, and what is its adaptability to still further application in competition with Rail Lines?

" Height of Buildings.

- (1) What considerations should limit the height of buildings?
- (2) Do recent developments in construction, sanitation, intercommunication and economy of administration, warrant the removal of all restrictions?

" Recent Practice in Rails.

The progressive increase in weight; the increase in hardness, particularly in carbon; the sections in most general use; the effect of changes in weight, composition and section.

" Filtration of Water for Public Use.

The several processes now used for the removal of objectionable matter; their comparative sanitary effect, cost and reliability.

" Do the interests of the profession, and the duty of its members to the public, require that only those who are competent be allowed to practice as Civil Engineers? Under what authority, through what agency, and upon what evidence of competency, should applicants be admitted to the practice of Civil Engineering?

" Steel-Concrete Construction.

What stress in tension and compression should be allowed in concrete?

What is the proper modulus of elasticity of concrete?

In Steel-Concrete Arches:

- (1) What should be the ratio of steel section to concrete section, and what is the best form and disposition of the former?
- (2) What consideration should be given to temperature changes and consequent stresses?
- (3) What are the best proportions for concrete, and what is the best method of placing it?

" The Decolorization of Water.

When is it necessary? How may it be accomplished?

" The Consumption of Water in Municipal Supplies and the Restriction of Waste."

ACCESSIONS TO THE LIBRARY.

DONATIONS.*

(From February 12th to March 12th, 1902.)

AN ELEMENTARY BOOK ON ELECTRICITY AND MAGNETISM AND THEIR APPLICATIONS.

A Text-Book for Manual Training Schools and High Schools, and a Manual for Artisans, Apprentices, and Home Readers. By Dugald C. Jackson, M. Am. Inst. E. E., and John Price Jackson, M. Am. Inst. E. E. $\frac{1}{2}$ Leather, $8 \times 5\frac{1}{2}$ ins., 11 + 482 pp., illus. New York, The Macmillan Company, 1902. \$1.40. (Donated by Dugald C. Jackson.)

While this book is more especially intended for an elementary text-book, the authors believe that it will prove a useful manual for apprentices and artisans, and have exerted every effort to make it clear, forceful and of strict scientific accuracy. There is an index of fourteen pages.

RECHERCHES SUR LES RIVIÈRES A MARÉE.

By H.-L. Partiot. Paper, 11×7 ins., illus., with atlas, 12×9 ins. Paris, E. Bernard & Cie., 1901. (Donated by the Author.)

The Contents are: Formules nécessaires à l'étude des rivières à marée; Détermination du régime futur d'un cours d'eau maritime; Étude de l'embouchure des rivières; La Seine maritime; La Loire maritime; Feuilles de hauteurs d'eau et tableaux du cubage.

CAST IRON.

A Record of Original Research. By William J. Keep, M. Am. Soc. M. E., M. Am. Inst. Min. E. Cloth, 9×6 ins., 15 + 225 pp., illus. New York, John Wiley & Sons, 1902. \$2.50.

The author states that since May, 1885, he has endeavored, by his method of testing, to discover the influence of the chemical elements in cast iron, and the results were recorded in the *Transactions* of the American Institute of Mining Engineers, prior to 1894. As a member of the Testing Committee of the American Society of Mechanical Engineers, he also made extensive experiments to determine the physical properties of cast iron, the results of which are recorded in the *Transactions* of that society. This volume contains the results of this whole line of research. The headings of chapters are: Definitions; Graphic Records; Methods of Investigation; Crystallization of Cast Iron; Carbon in Cast Iron; Silicon in Cast Iron; Shrinkage of Cast Iron; Keep's Cooling Curves, a Study of Molecular Changes in Metals Due to Varying Temperatures; Phosphorus in Cast Iron; Sulphur in Cast Iron; Manganese in Cast Iron; Segregation; Strength of Cast Iron; Impact; Graphic Method for Closely Approximating the Percentage of Silicon, the Shrinkage, and Strength of Any Other Size of Casting than the One Tested; Hardness or Workability of Metals; Mechanical Analysis or Chemical Analysis for Regulating Foundry Iron; Chemical Analysis Will Not Account for all Physical Properties of Cast Iron; Test-Bars; Keep's Testing Apparatus; Pig Irons and Silicon Irons; Testing Small Samples of Pig Iron; Aluminum in Cast Iron; Influence of Various Metals in Cast Iron. There is an index of sixteen pages.

The following gifts have also been received:

- | | |
|---|--|
| Am. Iron and Steel Assoc. 36 nos. | Madras Pub. Works Dept. 1 bound vol. |
| Am. Soc. for Prevention of Cruelty to Animals. 1 pam. | Mass. Board of Harbor and Land Commrns. 1 bound vol. |
| Boston Testing Laboratories. 4 vol. | Mass. Bureau of Statistics of Labor. 9 bound vol. |
| Coll. degli Ingegneri e Architetti in Palermo. 1 pam. | Morison, George S. 1 pam. |
| Davidson, George. 3 pam. | Munn & Co. 21 nos. |
| Fitchburg City Engr. 1 pam. | N. Y. Board of R. R. Commrns. 2 bound vol. |
| Heyland, Alexander. 4 pam. | North of England Inst. of Min. and Mech. Engrs. 1 pam. |
| Jackson, William. 5 bound vol., 3 pam. | Platt, T. C. 1 pam. |
| Königliche Technische Hochschule. 1 pam. | |

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

- Read, R. L. 7 pam.
 Richardson, Clifford. 1 pam.
 Schreiber, Collingwood. 1 vol.
 Swain, G. F. 1 pam.
 Switzerland hydrometriche Abteilung des
 eidg. Oberbauinspektorate. 7 pam.
 Thompson, Robt. A. 1 pam.
 Thrupp, Edgar C. 1 pam.
 U. S. Bureau of Statistics. 1 bound vol.
 U. S. Chief of Engrs. 14 pam.
 U. S. Commr. of Education. 1 bound vol.
 U. S. Geological Surv. 1 bound vol., 2 vol.,
 7 pam.
 U. S. Interstate Commerce Comm. 5
 pam.
 U. S. Navy Dept. 1 vol., 26 pam.
 U. S. Pub. Roads Inquiries. 1 pam.
 U. S. Weather Bureau. 2 pam.
 Univ. of Texas Mineral Surv. 1 pam.
 Wallace, J. F. 1 vol.
 Wallheim, Albert. 1 pam.
 Whipple, George C. 1 pam.

BY PURCHASE.

Bibliothèque du Conducteur de Travaux Publics; Publiée sous les Auspices de Messieurs les Ministres des Travaux Publics, de l'Agriculture, de l'Instruction Publique, du Commerce et de l'Industrie, de l'Intérieur, des Colonies, de la Justice. 43 vols. Paris, P. Vieq-Dunod et Cie., 1894-1902.

Le Chemin de Fer Métropolitain de Paris; Description du Réseau Projeté—Lignes Actuellement Exécutées, Usine de Bercy—Exploitation des Lignes en Service, Lignes Actuellement en Construction. Par A. Dumas. Paris, Ch. Béranger, 1901.

Deutsche Bauzeitung (to complete set). 13 vols.

SUMMARY OF ACCESSIONS.

February 12th to March 12th, 1902.

Donations (including 7 duplicates and 57 numbers completing volumes of periodicals).....	184
By purchase.....	57
Total.....	<hr/> 241

MEMBERSHIP.

ADDITIONS.

MEMBERS.

Date of
Membership.

BARBER, WILLIAM DAVIS,

Asst. Engr. in Chg., Div. of Pumping Station Constr. and Repairs, Dept. of Public Works (Res. 1700 Buckingham Pl., Chicago, Ill.)...	Assoc. M. M.	Sept. 1, 1897 Jan. 8, 1902
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DIEBITSCH, EMIL.

Engr. and Supt. for John Peirce, 277 Broad- way (Res., 80 Washington Sq.), New York City.....	Jun. Assoc. M. M.	Feb. 28, 1893 Oct. 6, 1897 March 5, 1902
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FISHER, ELSTNER,

Gen. Supt. and Chf. Engr., T., H. & B. Ry. Co., Hamilton, Ont., Canada.....	Jun. Assoc. M. M.	Apr. 3, 1889 June 2, 1897 March 5, 1902
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NORRIS, ROBERT VAN ARSDALE,

Chf. Engr., Pennsylvania R. R. Coal & Water Cos., Wilkesbarre, Pa.....	Jun. M.	Dec. 7, 1887 March 5, 1902
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ASSOCIATE MEMBERS.

BRENNKE, WILLIAM GEORGE,

(Brenneke & Fay, Cons. Civ. Engrs.), 1000 Fullerton Bldg., St. Louis, Mo.....		March 5, 1902
--	--	---------------

CRANE, CLARENCE AUSTIN,

Asst. Engr., Aqueduct Comm., Jerome Park Reservoir, 121 West 70th St., New York City.....		March 5, 1902
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HASSKARL, JOSEPH FREDERICK,

U. S. Engr. Office, 2310 Hancock St., Philadelphia, Pa..		March 5, 1902
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LAWTON, WALTER LUMAN,

Structural Engr. for N. Y. State Archt., 132 Chestnut St., Albany, N. Y.....		March 5, 1902
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MCCAFFERY, RICHARD STANISLAUS,

Supt., Santa Fe Gold & Copper Mining Co., San Pedro, N. Mex.....	Jun. Assoc. M.	May 4, 1897 Sept. 4, 1901
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MOTT, WILLIAM ELTON,

Asst. Prof. of Civ. Eng., Cornell Univ., Ithaca, N. Y....		March 5, 1902
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MUNROE, HERSEY,

Topographer, U. S. Geological Survey, Washington, D. C.....		March 5, 1902
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SHORT, WILLIAM AMBROSE DUDLEY,

Signal Engr., Cincinnati Div., C., N. O. & T. P. Ry. (Res., 90 Market St.), Lexington, Ky.....		Feb. 5, 1902
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SMITH, ALBERT HENRY,

Mech. Engr. and Chf. Insp., Toledo Branch of American Bridge Co., 1309 Utah St., Toledo, Ohio.....		Oct. 2, 1901
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	ASSOCIATES.	Date of Membership
FULLER, ALMON HOMER, Prof. of Civ. Eng., Univ. of Washington, Uni- versity Station, Seattle, Wash.....	Jun. } Assoc. Feb. 4, 1902	Apr. 4, 1899
PINCHOT, GIFFORD, Forester, U. S. Dept. of Agriculture, and Chief of Bureau of Forestry (Res., 1615 Rhode Island Ave.), Washington, D. C.....		March 4, 1902

JUNIORS.

BISELL, CLINTON TALCOTT, 258 Ryerson St., Brooklyn, N. Y.....	March 4, 1902
DUNNELLS, CLIFFORD GEORGE, 332 Mathilda St., Pittsburg, Pa.....	Feb. 4, 1902
MORPHY, LUIS GONZAGA, 75 Fourth St., Troy, N. Y.....	Feb. 4, 1902
RASTER, WALTHER, 391 W. Jackson Blvd., Chicago, Ill.....	Feb. 4, 1902
RAYNOR, CLARENCE WEBSTER, Jun. Engr., U. S. Engr. Office, 33 Campau Bldg., Detroit, Mich.....	Feb. 4, 1902

CHANGES OF ADDRESS.

MEMBERS.

ABBOTT, ARTHUR VAUGHAN.....	Care, Westinghouse, Church, Kerr & Co., 26 Cortlandt St., Room 812, New York City.
ALLEN, KENNETH.....	Cons. Engr., Equitable Bldg., Baltimore, Md.
BARDOL, FRANK VALENTINE ERHARD.....	Cons. and Contr. Engr., 400 D. S Morgan Bldg., Buffalo, N. Y.
BENSON, ORVILLE.....	Engr., American Bridge Co., Canton Plant, Canton, Ohio.
BLACKWELL, CHARLES.....	18 Hulbert Blk., Cincinnati, Ohio.
BONTECOU, DANIEL.....	605 Postal Telegraph Bldg., Kansas City, Mo.
CORTHELL, ARTHUR BATEMAN.....	Terminal Engr., Grand Central Station Impvts., N. Y. C. & H. R. R., 23 East 48th St., New York City.
CORTHELL, ELMER LAWRENCE.....	Berne, Switzerland; and 1 Nassau St., New York City.
DUGGAN, GEORGE HERRICK.....	Care, Dominion Iron & Steel Co., Sydney, N. S., Canada.
FARNUM, HENRY HARRISON.....	324 East 150th St., New York City.
HAYES, STANLEY WOLCOTT.....	Clif. Engr., J. C. & L. E. Ry., Westfield, N. Y.

JENKINS, WILLIAM DUNBAR.....	Engr. in Chg., Guthrie Extension, C., O. & G. R. R., Guthrie, Ind. T.
LEA, SAMUEL HILL	Hotel Wellington, Seventh Ave., near 55th St., New York City.
LEE, WELLINGTON BARNES.....	Hillburn, Rockland Co., N. Y.
LLEWELLYN, FRANCIS JOHN.....	Asst. to Vice-Pres., American Bridge Co., Monadnock Blk., Chicago, Ill.
PARKER, CHARLES JEREMIAH.....	Chf. Engr., Rutland R. R. Co., Rutland, Vt.
SMITH, JONAS WALDO.....	Engr. and Supt., The East Jersey Water Co., 308 Main St., Paterson, N. J.
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STUEBS, LINTON WADDELL.....	Atoka, Ind. T.
THOMPSON, ELLIS DUNN.....	Prin. Asst. Engr., U. S. Engr. Office, C 8 Army Bldg., 39 Whitehall St., New York City.
WAGNER, SAMUEL TOBIAS.....	Asst. Engr., P. & R. Ry. Co., 731 Reading Terminal, Philadelphia, Pa.
WEBSTER, CHARLES EDWARD.....	Prin. Asst. Engr., Western Dist., N. Y. C. & H. R. R. R., Syracuse, N. Y.

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BEUGLER, EDWIN JAMES.....	Res. Engr., The Boston Terminal Co., Boston, Mass.
HAZARD, ERSKINE	Chf. Surv., Lancaster Gold Mining Co., and The Lancaster West Gold Mining Co., Box 3197, Johannesburg, South Africa.
HOMAN, WILLIAM MACLEAN	Cons. Engr., 1 Mutual Bldgs., Smith St., Durban, Natal, South Africa.
KAHN, JULIUS.....	1117 Union Trust Bldg., Detroit, Mich.
LUND, GEORGE ALFRED.....	113f Central Ave., Bridgeport, Conn.
MARTIN, JAMES WILLIAM	525 Van Buren St., Pueblo, Colo.
PRUYN, FRANCIS LANSING	Asst. Engr., New East River Bridge, 13 Park Row, New York City.
PUTNAM, GEORGE ROCKWELL	Asst., U. S. Coast and Geodetic Survey, Washington, D. C.
THROOP, AUGUSTUS THOMPSON.....	Mgr., Buffalo Eng. Co., Erie Co. Bank Bldg., Buffalo, N.Y. (Res., 706 Buffalo Ave., Niagara Falls, N. Y.).
VOGLESON, JOHN ALBERT.....	2d Asst. Engr., Impvt., Extension and Filtration of Water Supply, Torresdale Filters, State Road and Pennypack St., Station "M," Philadelphia Pa.

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JUNIORS.

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SPENCER, LOUIS BERNARD.....Box 448, Salt Lake City, Utah.
WELLS, CLINTON GLENCAIRNPrin. Asst. Engr., Maryland & Pennsylvania R. R., North Ave. and Oak St., Baltimore, Md.
. .

FELLOWS.

- DARWIN, HARRY GILBERT.....Chf. San. Insp., Tenement House Dept., 44 Court St. (Res., 703 Vanderbilt Ave.), Brooklyn, N. Y.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(February 12th to March 12th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal*, Assoc. Eng. Soc., 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings*, Eng. Club of Phila., 1122 Girard St., Philadelphia, Pa.
- (3) *Journal*, Franklin Inst., Philadelphia, Pa., 50c.
- (4) *Journal*, Western Soc. of Eng., Monadnock Block, Chicago, Ill.
- (5) *Transactions*, Can. Soc. C. E., Montreal, Que., Can.
- (6) *School of Mines Quarterly*, Columbia Univ., New York City, 50c.
- (7) *Technology Quarterly*, Mass. Inst. Tech., Boston, Mass., 75c.
- (8) *Stevens Institute Indicator*, Stevens Institute, Hoboken, N. J., 50c.
- (9) *Engineering Magazine*, New York City, 30c.
- (10) *Cassier's Magazine*, New York City, 25c.
- (11) *Engineering* (London), W. H. Wiley, New York City, 35c.
- (12) *The Engineer* (London), International News Co., New York City, 35c.
- (13) *Engineering News*, New York City, 15c.
- (14) *The Engineering Record*, New York City, 12c.
- (15) *Railroad Gazette*, New York City, 10c.
- (16) *Engineering and Mining Journal*, New York City, 15c.
- (17) *Street Railway Journal*, New York City, 35c.
- (18) *Railway and Engineering Review*, Chicago, Ill.
- (19) *Scientific American Supplement*, New York City, 10c.
- (20) *Iron Age*, New York City, 10c.
- (21) *Railway Engineer*, London, England.
- (22) *Iron and Coal Trades Review*, London, England.
- (23) *Bulletin*, American Iron and Steel Assoc., Philadelphia, Pa.
- (24) *American Gas Light Journal*, New York City, 10c.
- (25) *American Engineer*, New York City, 20c.
- (26) *Electrical Review*, London, England.
- (27) *Electrical World and Engineer*, New York City, 10c.
- (28) *Journal*, New England Water-Works Assoc., Boston, 75c.
- (29) *Journal*, Society of Arts, London England.
- (30) *Annales des Travaux Publics de Belgique*, Brussels, Belgium.
- (31) *Annales de l'Assoc. des Ing. Sortis des Ecole Spéciales de Gand*, Brussels, Belgium.
- (32) *Mémoires et Compte Rendu des Travaux*, Soc. Ing. Civ. de France, Paris, France.
- (33) *Le Génie Civil*, Paris, France.
- (34) *Portefeuille Économique des Machines*, Paris, France.
- (35) *Nouvelles Annales de la Construction*, Paris, France.
- (36) *La Revue Technique*, Paris, France.
- (37) *Revue de Mécanique*, Paris, France.
- (38) *Revue Générale des Chemins de Fer et des Tramways*, Paris, France.
- (39) *Railway Master Mechanic*, Chicago, Ill.
- (40) *Railway Age*, Chicago, Ill., 10c.
- (41) *Modern Machinery*, Chicago, Ill., 10c.
- (42) *Transactions*, Am. Inst. Elec. Eng., New York City, 50c.
- (43) *Annales des Ponts et Chaussées*, Paris, France.
- (44) *Journal*, Military Service Institution, Governor's Island, New York Harbor, 75c.
- (45) *Mines and Minerals*, Scranton, Pa., 20c.
- (46) *Scientific American*, New York City, 10c.
- (47) *Mechanical Engineer*, Manchester, England.
- (48) *Proceedings*, Eng. Soc. W. Pa., 410 Penn Ave., Pittsburg, Pa., 50c.
- (49) *Transactions*, Mining Institute of Scotland, London and Newcastle-upon-Tyne.
- (50) *Municipal Engineering*, Indianapolis, Ind., 25c.
- (51) *Proceedings*, Western Railway Club, 225 Dearborn St., Chicago, Ill., 25c.
- (52) *American Manufacturer and Iron World*, 59 Ninth St., Pittsburg, Pa.
- (53) *Minutes of Proceedings*, Inst. C. E., London, England.
- (54) *Power*, New York City, 10c.
- (55) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.
- (56) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.

Bridge.

- Swing Bridges.* (21) Serial beginning May, 1901.
 The Triangulation for Bridge No. 4 across the East River, New York City. Oscar Erlandsen, M. Am. Soc. C. E. (13) Feb. 13.
 The Testing of Railway Bridges. (12) Feb. 14.
 The Fern Hollow Highway Arch Bridge.* (14) Serial beginning Feb. 15, ending Feb. 22.
 Plate-Girder Webs.* T. Graham Gribble, Assoc. M. Inst. C. E. (11) Feb. 21.
 A Non-Continuous Swing Bridge.* (13) Feb. 27.
 The Luxembourg 27-ft. Stone Arch Viaduct.* (13) Feb. 27.
 The Cambridge Bridge.* (Extracts from article in *Technology Review*.) (15) Feb. 28,
 Roath Bridge, Great Western Railway.* (12) Feb. 28.
 Westvale Concrete Bridge.* J. R. Worcester. (69) Mar.
 The Erection of the Luxembourg Stone Arch.* (14) Mar. 1.
 The Zanesville Concrete-Steel Y Bridge.* (14) Mar. 1.
 Étude Théorique sur la Résistance des Voutes. Léon Cosyn. (35) Serial beginning Sept., 1901.
 Le viaduc de Müngsten (Allemagne)* René Philippe. (35) Serial beginning Jan.,
 ending Feb.
 Influence des efforts dus à l'inclinaison et à l'action des freins sur les poutres principales
 d'un pont de chemin de fer à Forte Rampe.* M. Rey. (38) Feb.
 Note sur les conditions d'établissement et de stabilité des ponts, ponceaux et aqueducs
 en maçonnerie, murs de soutènement.* L. Lanave. (36) Serial beginning Feb. 10.
 Ponts levants du canal de l'Elbe à la Trave.* (33) Feb. 15.

Electrical.

- Electric Power Plants in the Mining Districts of Northern California.* G. P. Grimsley.
 (16) Serial beginning Aug. 31, 1901.
 High-Speed Electric Railway Car of the Allgemeine Elektricitäts Gesellschaft, Berlin.*
 O. Lasche. (27) Serial beginning Sept. 14, 1901.
 The Induction Motor for Electric Railways. (27) Serial beginning Sept. 14, 1901.
 The Debt of Electrical Engineering to C. E. L. Brown.* B. A. Behrend. (27) Serial begin-
 ning Nov. 16, ending Mar. 1.
 The Destructive and Lethal Effects of High-Pressure Currents. Dr. Margaret A.
 Cleaves. (26) Serial beginning Nov. 29, ending Feb. 28.
 The Economic Design and Management of Telephone Exchanges. Arthur V. Abbott.
 (27) Serial beginning Dec. 7, 1901.
 The Testing and Management of Electric Motors.* P. T. White. (26) Serial beginning
 Dec. 27, 1901.
 Engines and Batteries for Power Stations. (26) Serial beginning Jan. 24.
 Methods of Illumination. Louis Bell. (42) Feb.
 South London Electricity Works.* (26) Feb. 7.
 Earth Currents Derived from Distributing Systems.* E. Basil Wedmore. (Abstract of
 paper read before Inst. of Elec. Engrs.) (26) Serial beginning Feb. 7, ending
 Feb. 14.
 Recent Development of the Atomic Theory and its Connection with Light and Elec-
 tricity. C. C. Garrard. (26) Serial beginning Feb. 7, ending Feb. 14.
 Modern Commutating Dynamo Machinery, with Special Reference to the Commutating
 Limits.* H. M. Hobart, M. I. E. E. (Paper read before International Eng. Con-
 gress.) (11) Serial beginning Feb. 7, ending Feb. 21.
 The Brush Electrical Engineering Company.* (11) Serial beginning Feb. 7, ending
 Feb. 14.
 Practical Notes on Continuous-Current Distributing Mains.* John C. A. Ward. (Ab-
 stract of paper read before Glasgow Section of Inst. of Elec. Engrs.) (47) Feb. 8.
 Electricity in Glass Manufacture.* (12) Feb. 14.
 Bermondsey Electricity Works.* (26) Feb. 14.
 The Westinghouse Integrating Wattmeter. (26) Feb. 14.
 Wireless Telegraphy. H. W. Sullivan. (26) Feb. 14.
 Some Results of a Secondary Battery in a Traction Station. (26) Feb. 14.
 The Leakage of Current from Buried Bare Conductors.* (26) Feb. 14.
 How to Construct an Efficient Wireless Telegraph Apparatus at a Small Cost.* A.
 Frederick Collins. (10) Feb. 15.
 Rotary Disks. Alfred G. Dell. (27) Feb. 15.
 Energy Consumption and Electric Automobile Performance.* H. W. Alden. (27)
 Feb. 15.
 The Power Plant of the New United States Min. at Philadelphia.* (14) Feb. 15.
 Storage Batteries in the Baltimore Bell Line Tunnel Power Plant.* (27) Feb. 15.
 The Imperial Cable. (12) Feb. 21.
 Worksop Electricity Works.* (26) Feb. 21.
 Designing of Continuous Current Dynamos. Aubrey Clayton. (26) Feb. 21.
 An Improved Theater Dimmer.* (27) Feb. 22.
 The Dalles, Oregon, Transmission Plant.* (27) Feb. 22.
 Armature Interference and Brush Position. H. M. Hobart. (26) Serial beginning
 Feb. 28.
 The New Direct Current Works of the City of London Electric Lighting Company.*
 (26) Feb. 28.
 Telpherage; a System of Electric Traction.* A. S. Clift. (10) Mar.

Electrical—(Continued).

- Electric Power in American Cotton Mills.* W. B. Smith Whaley. (10) Mar.
 Electric Appliances in Ship-building Yards.* Sydney F. Walker. (9) Mar.
 The Generators, Transformers and Rotary Converters for the Manhattan Railway.* (64) Mar.
 Slaby-Arco Wireless Telegraph Apparatus.* A. Frederick Collins. (27) Mar. 1.
 The National Telephone Company's New Exchange at Kensington, London.* (27) Mar. 1.
 Two Recent English Central Stations.* (27) Mar. 1.
 The New Toll Line Boards of the Chicago Telephone Company.* (27) Mar. 1.
 Power Transmission Plant for Lighting the Cornwall Canal, Canada.* (27) Mar. 1.
 The General Problem of Wave Propagation over Non-Uniform Conductors. M. I. Pupin. (27) Mar. 1.
 The Thomson Method of Making Tubes Electrically.* (20) Mar. 6.
 The Guarini Repeating Wireless Telegraph System.* A. Frederick Collins. (46) Mar. 8.
 Development of a Great Water Power System at Hartford, Conn.* Alton D. Adams. (27) Mar. 8.
 District Electrical Supply.* (27) Mar. 8.
 The Heavy Enclosed Arc Lamp.* E. Trier. (27) Mar. 8.
 La Construction et l'Établissement des Alternateurs.* (36) Serial beginning Oct. 10, 1901.
 Transmission de force par l'électricité dans les ateliers de la Palmer Shipbuilding and Iron Co. à Jarrow-sur-Tyne (Angleterre).* Ch. Dantin. (33) Feb. 1.

Marine.

- Graphic Analyses of Propeller Reactions. J. Millen Adam. (11) Serial beginning Sept. 20, 1901.
 The New Bermuda Floating Dock. (11) Feb. 14.
 Naval Engineers. D. B. Morison. (Paper read before North-East Coast Inst. of Engrs. and Shipbuilders.) (11) Serial beginning Feb. 14, ending Feb. 21.
 The Armoured Cruiser *Good Hope*.* (11) Feb. 28.
 The Russian Battleship *Pobieda*.* (12) Feb. 28.
 Water-Tube Boilers.* (Report of Committee appointed by the Admiralty to inquire into the question of water-tube boilers for the Navy.) (11) Serial beginning Feb. 28.
 La Navigation Sous-Marine.* H. Noalhat. (36) Serial beginning Feb. 25, 1901.
 Deformation and résistance des coques de navire. flexion transversale. H. Chaigneau. (36) Serial beginning Feb. 25, 1902.

Mechanical.

- Improvements in the Steam Engine.* W. H. Wakeman. (41) Serial beginning Jan., 1901.
 Die Forging.* Joseph Horner. (11) Serial beginning May 3, 1901, ending Feb. 14, 1902.
 The Hydraulic Brake.* Robert A. Bruce. (47) Serial beginning May 11, 1901.
 Bevel-Gear Cutting Machines at Paris.* Fred. J. Miller. (47) Serial beginning June 8, 1901.
 Machinery at the Pan-American Exposition.* (20) Serial beginning July 18, 1901.
 Design and Construction of Machine Tools.* Thomas R. Shaw. (47) Serial beginning July 28, 1901.
 Pneumatic Tools at the Glasgow Exhibition.* (11) Serial beginning Aug. 23, 1901.
 The Principles and Design of Modern Drying Plant.* (12) Serial beginning Oct. 4, 1901.
 Some Typical Experimental Steam Engine Installations.* W. W. F. Pullen, Assoc. M. Inst. C. E., M. I. Mech. E. (47) Serial beginning Oct. 26, 1901.
 Air Motors.* W. C. Popplewell, Assoc. M. Inst. C. E. (47) Serial beginning Nov. 9, 1901.
 Machine Tools at the Glasgow Exhibition.* Fred. Bathurst. (26) Serial beginning Nov. 22, 1901.
 Hydraulic Pumping Machinery.* Fr. Froelich. (11) Serial beginning Dec. 6, 1901.
 Shaft Fractures Due to Oscillations in Direct-Coupled Units at Critical Speeds. Julius Frith and Ernest H. Lamb. (47) Serial beginning Dec. 28, 1901.
 Shrinkage and Pressure-Joints.* William Ledyard Cathcart. (6) Jan.
 The Paris Motor Car Show.* (12) Serial beginning Jan. 3.
 Some Notes on Steam Turbines.* F. J. Warburton. (Paper read before North-East Coast Inst. of Engrs. and Shipbuilders.) (12) Feb. 7.
 The Bignal & Keeler Duplex Pipe Machine.* (20) Feb. 13.
 Gas and Gasoline Engine Ignition. Albert Stritmatter. (62) Serial beginning Feb. 13, ending Feb. 20.
 Plate Springs.* (12) Feb. 14.
 A Well-Designed Brass Furnace.* (40) Feb. 14.
 Steam Boilers for Electric Power Stations. C. E. Stromeyer, M. I. C. E. (Paper read before Manchester Section of Inst. of E. E.) (47) Feb. 15.
 Mechanical Plant of the Albany Station of the New York Central & Hudson River Railroad Company.* (14) Feb. 15.
 Crude Petroleum as Fuel. Robert P. Skinner. (19) Feb. 15.
 New Carburetted Water Gas Plant at Oldham, England.* (Reprint from *Journal of Gas Lighting*.) (24) Feb. 17.
 A Rotary Brush System of Feeding Pulverized Fuel to Furnaces.* (13) Feb. 20.

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- Canning Automatic Screw Machines.* C. L. Goodrich. (20) Feb. 20.
 The Crystal Palace Motor Car Show.* (12) Feb. 21.
 The Dörr Water-Tube Boiler.* S. J. Thompson. (22) Feb. 21.
 The Working Loads for Manila Rope.* C. W. Hunt. (11) Feb. 21.
 Appliances Driven by Compressed Air.* W. C. Popplewell, Assoc. M. Inst. C. E. (47) Feb. 22.
 Central Heating & Lighting Plant for the County Buildings, Indianapolis, Ind.* (14) Feb. 22.
 The Efficiencies of Chain Blocks.* (47) Feb. 22.
 Gas and Other Internal Combustion Engines.* Dugald Clerk. (Paper read before Institution of Engrs. and Shipbuilders in Scotland.) (47) Serial beginning Feb. 22.
 A Mammoth Sellers Planer.* (20) Feb. 27.
 The Nutting Automatic Multiple Spindle Drill.* (20) Feb. 27.
 Kuhn's Coal-Stamping Machinery.* (22) Feb. 28.
 Industrial Motor Cars in France.* (12) Feb. 28.
 On Explosions of Steam Pipes Due to Water-Hammer.* C. E. Stromeyer, M. Inst. C. E. (11) Feb. 28.
 The Station of the Independent Electric Light and Power Co., San Francisco, Cal.* (64) Mar.
 Evolution of the Shaft Governor.* R. C. Carpenter. (Paper read before the Engine Builders' Assoc.) (64) Mar.
 Experiments on Spiral Springs, Chas. H. Benjamin and Roy A. French. (Paper read before Am. Soc. M. E.) (25) Mar.
 A New Tender Draft Casting for Friction Draft Gear.* Frank B. Kleinhans. (25) Mar.
 The Briquetting of Fuels and Fine Mineral Ores.* Wm. Gilbert Irwin. (9) Mar.
 Efficiency of Bituminous Coal. Harlan J. German. (39) Mar.
 Correcting for Variations in Indicator Springs.* A. Koob. (64) Mar.
 Hampton Boiler Plant; Description of a New Boiler Plant of the D. L. & W. Coal Mining Department at Scranton, Pa.* (45) Mar.
 Horse-power of Belting and Pulleys.* E. C. De Wolfe. (64) Mar.
 Lubrication of Machine Tools; Requirements in Locating Oil Holes.* (41) Mar.
 Steam Hoisting Engines.* (41) Mar.
 A New Vane Gear for Gas, Steam and Air Engines.* Ernest W. Naylor. (Paper read before Am. Soc. M. E.) (41) Mar.
 Steam Carriages.* (46) Mar. 1.
 Gasoline Automobiles.* (46) Mar. 1.
 Electric Vehicles.* (46) Mar. 1.
 The Packard Gasoline Touring Car. (46) Mar. 1.
 The New Light Panhard-Levassor Automobile.* (10) Mar. 1.
 Distributing Artificial Gas at High Pressure in a Suburban Locality.* George F. Goodnow. (Paper read before New England Assoc. of Gas Engrs.) (24) Mar. 3.
 Traction on Wagon Roads.* Ira O. Baker, M. Am. Soc. C. E. (13) Mar. 6.
 Modern Steam Engine Practice Abroad.* Frank C. Perkins. (62) Mar. 6.
 Possible Improvements in the Gas Engine. (62) Mar. 6.
 Improved Blowers for Gas Producers.* (20) Mar. 6.
 Ore Handling at Furnaces. Waldon Fawcett. (46) Mar. 8.
 The Table Photometer and the Standard Pentane Lamp. (Abstract from the *Journal of Gas Lighting*.) (24) Mar. 10.
 Étude des Machines à Vapeur par le Diagramme Entropique. J. Bouly. (37) Serial beginning Mar., 1901.
 Condenseurs par Mélange et pompes à Air.* Joseph Nadal. (37) Serial beginning June, 1901.
 Les Moteurs à Gaz des Hauts Fourneaux. Jules Deschamps. (37) Serial beginning July, 1901.
 Essai sur la Théorie des Moteurs à Gaz. Jules Deschamps. (37) Serial beginning July, 1901.
 Appareils de Sureté des Chaudières à Vapeur. François Sinigaglia. (37) Serial beginning July, 1901.
 Nouvelles Voitures à Air Comprimé de la Compagnie Générale des Omnibus à Paris.* G. Boîto. (33) Serial beginning July 13, 1901.
 Expériences sur une Machine à Vapeur de MM. Weyher et Richemond. J. Hirsch. (37) Serial beginning Aug., 1901.
 Application du principe de la conservation de l'énergie au fonctionnement des ventilateurs centrifuges.* A. H. Courtois. (37) Jan.
 Les surchauffeurs de vapeur; progrès récents réalisés dans leur construction.* Maurice Miet. (33) Feb. 1.
 Machine à fabriquer les vis.* (33) Feb. 8.
 Ventilateurs pour hautes pressions mis par turbines à vapeur.* A. Rateau. (33) Feb. 8.
 Note sur un dispositif simple permettant d'opérer un bombé théorique sur la jante des poulies et des volants.* (36) Feb. 10.
 Pompes centrifuges à haute pression avec moteurs électriques et turbines à vapeur. A. Rateau. (33) Feb. 15.
 Nouveaux Monte-Courroies fixes pour transmissions.* Henry Mamy. (33) Feb. 15.
 Tours verticaux construits par les ateliers Ducommun, à Mulhouse.* G. Nardin. (33) Feb. 22.
 La vapeur surchauffée, de 1827 à nos jours.* G. Loffet. (36) Serial beginning Feb. 25.

Metallurgical.

Iron Foundries and Foundry Practice in the United States.* (12) Serial beginning Sept. 27, 1901.

Modern Methods of Gold Extraction.* Walter E. Koch. (58) Jan.

The David Copper Process.* (19) Feb. 22.

Some Unsolved Questions of Ore Treatment: A Consideration of Some of the Mechanical and Other Imperfections in Milling Processes.* O. H. Howarth. (45) Mar.

Anacconda Copper Mining Company's New Reduction Works.* (16) Mar. 1.

L'Épuration des Gaz de Haut Fourneau.* Jules Deschamps. (37) Serial beginning June, 1901.

Les récents progrès de la métallurgie du fer et de l'acier.* L. Gautier. (34) Serial beginning Feb.

Chargeuse électrique, système Wellman, pour fours Siemens-Martin.* (33) Feb. 15.

Military.

The Evolution of Fire-Arms and Ordnance and Their Relation to Advancing Civilization.

Joseph Wheeler. (3) Mar.

Le Matériel d'Artillerie.* (37) Serial beginning Feb., 1901.

Mining.

Notes on Mine Hoisting Engines. Robert Peele. (6) Jan.

Dredging for Fine Gold in Idaho.* Robert Bell. (16) Feb. 15.

The Coos Bay Coal Fields.* Cleveland Rockwell. (16) Serial beginning Feb. 15.

Iowa's Iron Mine.* S. W. Beyer. (16) Feb. 22.

The Universal Colliery Explosion.* W. Galloway. (22) Feb. 28.

Winding from Great Depths.* (22) Serial beginning Feb. 28.

Mine Motor Traction.* (45) Mar.

Mine Explosions. (45) Mar.

Underground Compressed-Air Mine Plant; the Application of Compressed Air to Rock Drills, Pumps, Hoisting Engines, and Coal Cutters. Robert Peele. (45) Mar.

Conveying Machinery in Coal Mining.* S. Howard-Smith, M. Am. Soc. M. E. (10) Mar.

Electricity in Mining.* George H. Gibson. (16) Mar. 1.

Coal Cutting by Machinery in British Collieries.* Sydney F. Walker. (16) Mar. 8.

Les nouveaux fonçages par congélation.* H. Schmerber. (33) Serial beginning Jan. 18, ending Feb. 1.

Municipal.

Oil in Street Construction. (14) Feb. 22.

Asphalt Paving under Municipal Management.* F. E. Puffer. (60) Mar.

Cost of Building Macadam Roads at Port Huron, Mich.* Frank F. Rogers. (Abstract of paper read before Mich. Eng. Soc.) (13) Mar. 6.

L'arroisement de la voie publique à Paris.* E. Bret. (33) Feb. 22.

Railroad.

Locomotive Draft Appliances. (25) Serial beginning Oct., 1901.

The New Victoria Station at Nottingham.* (11) Serial beginning Nov. 15, 1901.

The Balancing of Locomotives. W. E. Dalby. (11) Serial beginning Nov. 22, 1901; (47) Serial beginning Nov. 23, 1901.

Electric Traction on Railways. (21) Serial beginning Jan., ending Feb.

Compound Tank Locomotive, Indian-Netherlands Railway, Java.* (12) Serial beginning Jan. 3.

The Bolster Problem. R. P. Lamont. (61) Jan. 21.

An Automatic Pressure Retainer for Driver Brakes.* J. E. Muhlfeld. (21) Feb.

The Relation of Energy and Motor Capacity to Schedule Speed in the Moving of Trains by Electricity.* Cary T. Hutchinson. (42) Feb.

American Engineer Tests of Locomotive Draft Appliances; Tests of Locomotive Stacks.* W. F. M. Goss. (25) Serial beginning Feb.

Egyptian Experimental Locomotives.* (12) Feb. 7.

Report of the New York State Railroad Commission on the Park Ave. Tunnel Collision. (13) Feb. 13.

A Portable Accelerometer for Railroad Testing. F. B. Corey. (Extract from paper presented before Am. Soc. M. E.) (15) Feb. 14.

By-pass and Starting Valves, A. T. & S. F. Four Cylinder Tandem Compound.* (40) Feb. 14.

British and French Train Services in 1901. Charles Rous-Martens. (12) Serial beginning Feb. 14, ending Feb. 21.

Compound Consolidation Locomotive, M., St. Paul and S. Ste. M. Ry.* (18) Feb. 15.

Electric Headlights on the Chicago, Milwaukee & St. Paul Ry.* (18) Feb. 15.

Kinsman Block System for Control of Railway Trains.* (27) Feb. 15.

Test of an Automatic Air-Safety Valve by the Pennsylvania Lines.* (18) Feb. 15.

The Cincinnati Southern Ry. and Its Improvements.* (13) Feb. 20.

Express Engines, Furness Railway.* (12) Feb. 21.

The Morrison Automatic Air Safety Valve.* (40) Feb. 21.

The Miller Locomotive Cab Signal.* (15) Feb. 21.

Notes on the Wear of Journals.* David Van Alstine. (Reprinted from Proc., North-West Ry. Club.) (15) Feb. 21.

Railroad—(Continued).

- The Design and Construction of Railway Carriages in India.* C. F. Bamford, Assoc. M. Inst. C. E.) (11) Serial beginning Feb. 21.
 Self-Turning Snow Plow on the Delaware, Lackawanna & Western R. R.* (18) Feb. 22.
 Baldwin Compound Consolidation Locomotive for Southern Pacific Company.* (18) Feb. 22.
 Test of a Ball Bearing Car Journal on the Fitchburg Electric Ry.* (18) Feb. 22.
 Balancing of Locomotive Engines. (12) Feb. 28.
 A Baldwin Four-Cylinder Balanced Compound for the Plant System.* (15) Feb. 28.
 Santa Fé Combination Steel and Wood Box Car, 80,000 Pounds' Capacity.* (40) Feb. 28.
 The New York Central Box Car.* (40) Feb. 28.
 80,000-lb. Capacity Box Car; New York Central & Hudson River Railroad.* (25) Mar.
 Compound Ten-Wheel Passenger Locomotive; Vauclain Four-Cylinder Balanced System.* (25) Mar.
 Modern French Locomotive Practice.* Charles Rous-Marten. (10) Mar.
 The Differentiation of the American Locomotive. J. C. Bayles. (20) Mar. 6.
 Some Factors Affecting the Power of Locomotives.* W. F. M. Goss, M. Am. Soc. M. E. (Paper read before New England R. R. Club.) (13) Mar. 6.
 The Construction of the Aspen, Wyoming, Tunnel on the Union Pacific Railroad.* W. P. Hardesty. (13) Mar. 6.
 The Vauclain Four Cylinder Balanced Compound for the Plant System.* (40) Mar. 7.
 Baldwin 20,000-lb. Locomotive, 10-Wheel Compound, for the Plant System. (18) Mar. 8.
 Vibrations Caused by Underground Railway Trains. (14) Mar. 8.
 L'Exposition Universelle de 1900; Notice sur le Matériel et les Objets Exposés par les Chemins de Fer de l'Etat.* (38) Serial beginning Mar., 1901.
 Etude sur les Locomotives Américaines.* J. Oudet. (37) Serial beginning Oct., 1901.
 Locomotive compound à grande vitesse, de la Compagnie des Chemins de fer du Nord français.* Le Fleuter. (34) Feb.
 Triage Mécanique des petits colis de messageries (au départ) dans la gare de Paris-Austerlitz.* M. Pons. (38) Feb.
 Les Chemins de fer de la Tunisie. G. Espitalier. (33) Feb. 22.

Railroad, Street.

- The New Subway in New York City.* Charles Prelini. (11) Serial beginning Oct. 4, 1901.
 The New York Rapid Transit Railway.* (13) Serial beginning Jan. 30.
 The Selection of Electric Motors for Railway Service. W. B. Potter. (42) Feb.
 Manchester and Liverpool High-Speed Electrical Railway. F. B. Behr, Assoc. Inst. C. E. (Abstract of paper read before Glasgow Technical College Scientific Society.) (47) Feb. 8.
 The Salford Corporation Tramways.* (17) Feb. 22.
 Opening of the Electric Elevated Underground Road, Berlin, Germany.* (27) Mar. 1.
 Steel Street Car Wheels. W. L. Wright. (17) Mar. 1.
 The Great Northern and City Railway.* (17) Mar. 1.
 The Camps Bay, Cape Town & Sea Point Tramways.* (17) Mar. 1.
 Design for a Power Station in Providence.* (17) Mar. 1.
 Joint Construction and Wheels in Philadelphia.* (17) Mar. 1.
 The Double Trolley Trackless Motor Car.* Max Schiemann. (17) Mar. 1.
 The Electrical Equipment of the Providence, Warren & Bristol Railroad.* (17) Mar. 1.
 The Twin City Rapid Transit Company; a Study in Financial and Operating Policy.* (17) Mar. 1.
 Concrete Roadbed Construction for Street Railways.* (13) Mar. 6.
 Traction électrique sur les lignes de Milan à Gallarate, Varese, Porto Ceresio, Arona et Laveno du réseau de la Compagnie Italienne de la Méditerranée.* (38) Feb.
 Traction par trolley automoteur.* Jean Loubat. (36) Feb. 25.

Sanitary.

- Drainage Improvement by Dredging.* E. E. Watts. (Abstract of paper read before Indiana Eng. Soc.) (13) Feb. 13.
 The Early History of the Memphis Sewers. A. T. Bell. (Extracts from paper read before Memphis Eng. Soc.) (14) Feb. 15.
 The Sewerage Systems of Sydney. N. S. W. (14) Feb. 15.
 The Septic Tank System at Fond du Lac. (14) Feb. 22.
 Heating and Ventilating Railway Shops at Elizabethport.* (14) Feb. 22.
 The Recent Epidemic of Typhoid Fever at Baraboo, Wis., and Its Probable Relation to the Water Supply.* W. G. Kirchoffer. (13) Feb. 27.
 The Use of Concrete in Sewer Construction.* Harry V. Gifford. (Abstract of paper read before Mich. Eng. Soc.) (60) Mar.
 The Drainage of Swamps for Watershed Improvement.* Edward S. Larned. (28) Mar.
 Ventilation and Heating in the U. S. Mint, Philadelphia.* (14) Mar. 1.
 Plumbing in the Astor Apartment House, New York.* (14) Mar. 1.
 The Ventilation of the Simplon Tunnel.* (14) Mar. 8.
 Incinération des ordures ménagères à Milwaukee (États-Unis).* (33) Feb. 22.

Structural.

- Impact Tests on Notched Steel Bars. (11) Feb. 7.
 The Cement Works of I. C. Johnson and Co., Ltd., Greenhithe.* (12) Feb. 7.

Structural—(Continued).

- Cell Construction in the Tombs Prison, New York.* (14) Feb. 15.
 A New Method of Testing Fire-Resisting Qualities of Fire-proofed Wood.* Ira H. Woolson, M. Am. Soc. M. E. (13) Feb. 20.
 Concrete Coke Bins.* (40) Feb. 21.
 Earthquake-Proof Buildings in Japan.* (14) Feb. 22.
 A Holder Foundation on Quicksand. C. A. Learned. (Paper read before New England Assoc. of Gas Engrs.) (24) Feb. 24.
 Theory of the Strength of Beams of Reinforced Concrete. W. Kendrick Hatt. (Abstract of paper presented before Indiana Eng. Soc.) (13) Feb. 27.
 Fireproof Grain Elevator Construction.* Jas. Macdonald. (3) Mar.
 The Chamber of Commerce Building, New York.* (14) Mar. 1.
 The Rudelsburg Portland Cement Works.* (14) Mar. 1.
 The Design of Steam Power Plants.—Chiunneys. Henry C. Meyer, Jr.* (14) Mar. 1.
 The Hanover National Bank Building, New York. (14) Mar. 8.
 The Building of a Water Gas Plant.* C. W. Tippy. (Paper read before Mich. Gas Assoc.) (24) Mar. 10.
 Machines à essayer les matériaux de construction; Mohr et Federhoff.* (36) Jan. 25.
 Groupe scolaire à Châtillon-sous-Bagny (Seine). E. Rivoalen. (35) Feb.

Water Supply.

- Settling Basins and Slow Sand Filter Beds for Pittsburg, Pa.* (13) Feb. 13.
 The Measurement of Water.* C. V. Seastone. (Abstract of paper read before Indiana Eng. Soc.) (14) Feb. 15.
 The High Earth Dam Forming Drnid Lake, Baltimore Water-Works.* Alfred M. Quirk, Assoc. M. Am. Soc. C. E. (13) Feb. 20.
 New Waterworks at Pittsburg.* (12) Feb. 21.
 The Recent Epidemic of Typhoid Fever at Baraboo, Wis., and Its Probable Relation to the Water Supply.* W. G. Kirchoffer. (13) Feb. 27.
 The Water-Works System of Middletown, N.Y.* (60) Mar.
 Water Purification.* P. A. Maignen. (3) Mar.
 A Gas Engine Driven Direct Pressure Pumping Plant, with Some Experiments on Pump Valve Area. D. W. Mead. (3) Mar.
 Report on the St. Louis Water Supply by an Expert Commission. Abstracted by Robt. E. McMath, M. Am. Soc. C. E. (13) Mar. 6.
 The Dam and Power Station of the Hudson River Water Power Co.* (14) Mar. 8.
 A New Automatic Movable Dam.* (14) Mar. 8.
 Development of a Great Water Power System at Hartford, Conn.* Alton D. Adams. (27) Mar. 8.
 Note sur les compteurs d'eau.* M. Couronne. (37) Serial beginning Jan.
 Projet et prix de revient des réservoirs d'alimentation des villes.* (36) Jan. 25.

Waterways.

- The Dortmund and Ems Canal. Herr Regierungs and Baurath Hermann. (11) Serial beginning Sept. 6, 1901.
 The Practical Building of Lowland Protections. Percy H. Wilson. (19) Serial beginning Jan. 4.
 The North-Sea Canal, the Ymuiden Locks, and the Port of Amsterdam.* (11) Serial beginning Jan. 10, ending Feb. 28.
 The Enlargement of the Sault Canal.* Waldon Fawcett. (62) Feb. 20.
 A Proposed Dam and Water Power on the Mississippi River at Keokuk, Iowa. Lyman E. Cooley. (3) Mar.
 Utilisation des Canaux pour le Relèvement de Nos Ports de Transit. (36) Serial beginning June 25, 1901.
 Le canal Soulange (Canada).* (33) Feb. 1.

* Illustrated.

PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS.
(INSTITUTED 1852.)

VOL. XXVIII. No. 4.
APRIL, 1902.

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of presentation to the Society, are given.

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Papers and Discussions.....Pages 327 to 425.

NEW YORK 1902.

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American Society of Civil Engineers.

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ON UNIFORM TESTS OF CEMENT:—George S. Webster, George F. Swain, Alfred Noble, W. B. W. Howe, Louis C. Sabin, S. B. Newberry, Clifford Richardson, Richard L. Humphrey, F. H. Lewis.

The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK

TELEPHONE NUMBER, - - - - 533 Columbus.
CABLE ADDRESS, - - "Ceas. New York."

AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

April 2d, 1902.—The meeting was called to order at 8.45 p. m., James Owen in the chair; Charles Warren Hunt, Secretary; and present, also, 81 members and 5 guests.

The minutes of the meetings of March 5th and 19th were approved as printed in the *Proceedings* for March, 1902.

A paper by Marsden Manson, M. Am. Soc. C. E., entitled "A Brief History of Road Conditions and Legislation in California," was presented by the Secretary and discussed by Messrs. James Owen and George W. Tillson.

A second paper, by Charles C. Wentworth, M. Am. Soc. C. E., entitled "Line and Surface for Railway Curves," was presented by the Secretary, who also read a communication on the subject from James K. Geddes, M. Am. Soc. C. E.

Ballots for membership were canvassed and the following candidates were elected:

AS MEMBERS.

CHARLES ALDO ALDERMAN, Columbus, Ohio.
EDWARD RICHARD CARY, Troy, N. Y.
CHARLES FREDERICK DUNHAM, Sierra Mojada, Mexico.
FELIX FREYHOLD, Washington, D. C.
JOHN VENABLE HANNA, Springfield, Mo.
JOHN LEWIS HOWARD, Boston, Mass.
WILLIAM HENRY LUSTER, Jr., Elizabeth, N. J.
GEORGE SERGEANT, Jr., Brooklyn, N. Y.

AS ASSOCIATE MEMBERS.

GEORGE WASHINGTON ARMITAGE, Havana, Cuba.
HAROLD BEDFORD ATKINS, New York City.
JOHN WALKER BARRIGER, Jr., Kansas City, Mo.
MURRAY BLANCHARD, Detroit, Mich.
BENJAMIN FRANKLIN CRESSON, Jr., New York City.
FREDERICK HAROLD FAY, Boston, Mass.
GUSTAVUS ADOLPHUS GESSNER, Jr., Toledo, Ohio.
CHARLES GILMAN HYDE, Philadelphia, Pa.
GEORGE WASHINGTON LILLY, Columbus, Ohio.
HARRY JOHN McDARGH, Dayton, Ohio.
WALTER EDWIN NOBLE, Fall River, Mass.
HERMAN SCHNEIDER, South Bethlehem, Pa.
CHARLES ALBERT SLAYTON, Wapanucka, Ind. T.
PERLEY EGBERT STEVENS, Philadelphia, Pa.
THOMAS HOLLIS WIGGIN, Jersey City, N. J.
HENRY FELIX WILSON, Jr., Birmingham, Ala.

The Secretary announced the election of the following candidates by the Board of Direction on April 1st, 1902:

AS ASSOCIATE.

FRANKLIN LINCOLN GAINES, Grand Rapids, Mich.

AS JUNIORS.

FRANK RAHN SHUNK LAYNG, Pittsburg, Pa.
HANS CARL THOMAS TOENSFELDT, St. Louis, Mo.
JOHN GEORGE ULLMANN, Buffalo, N. Y.
GEORGE LITTLETON WARNER, Washington, D. C.

The Secretary announced the subjects, adopted by the Publication Committee, for topical discussion at the Annual Convention.*

The Secretary announced the death of NATHANIEL CHENEY, elected Fellow July 21st, 1870; died June 29th, 1901.

The Secretary announced the appointment, by the Board of Direction, of the following Special Committee on Rail Sections:

G. BOUSCAREN, *Chairman*;

C. W. BUCHHOLZ,

H. G. PROUT,

S. M. FELTON,

JOSEPH T. RICHARDS,

ROBERT W. HUNT,

PERCIVAL ROBERTS, JR.,

JOHN D. ISAACS,

GEORGE E. THACKRAY,

RICHARD MONTFORT,

EDMUND K. TURNER,

WILLIAM R. WEBSTER.

Adjourned.

April 16th, 1902.—The meeting was called to order at 8.40 p. m., Emil Kuichling, Director, Am. Soc. C. E., in the chair; Charles Warren Hunt, Secretary; and present, also, 126 members and 11 guests.

A paper by Archibald R. Eldridge, M. Am. Soc. C. E., entitled "Is it Unprofessional for an Engineer to be a Patentee?" was presented by the Secretary and discussed by Messrs. Samuel Whinery and James Owen.

A second paper, by Joseph Mayer, M. Am. Soc. C. E., entitled "The Stiffening System of Long-Span Suspension Bridges for Railway Trains," was read by title and discussed by Messrs. L. S. Moisieff, H. A. La Chicotte, W. Hildenbrand and L. L. Buck.

The Secretary announced the leading features of the programme for the Annual Convention.

The Secretary announced the death of EMILIO DEL MONTE, elected Member December 4th, 1895; died March 20th, 1902.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

April 1, 1902.—8.20 p. m.—Vice-President Schneider in the chair; Charles Warren Hunt, Secretary, and present, also, Messrs. Briggs, Buck, Croes, Endicott, Knap, Pegram, Seaman and Wilgus.

Action was taken completing the Special Committee to report on Rail Sections.

Applications were considered, and various matters of business detail transacted.

One candidate for Associate and four for Junior were elected.†

Adjourned.

* See page 127.

† See page 124.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, May 7th, 1902.—8.30 p. m.—At this meeting, ballots for membership will be canvassed, and a paper by George S. Webster and Samuel Tobias Wagner, Members, Am. Soc. C. E., entitled “The Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa.,” will be presented for discussion.

This paper was printed in the *Proceedings* for March, 1902.

Wednesday, June 4th, 1902.—8.30 p. m.—At this meeting, ballots for membership will be canvassed, and a paper by George L. Dillman, M. Am. Soc. C. E., entitled “A Proposed New Type of Masonry Dam,” will be presented for discussion.

This paper is printed in this number of *Proceedings*.

Wednesday, September 3d, 1902.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and a paper by R. C. McCalla, M. Am. Soc. C. E., entitled “Improvement of the Black Warrior, Warrior and Tombigbee Rivers, in Alabama,” will be presented for discussion.

This paper is printed in this number of *Proceedings*.

ANNUAL CONVENTION OF 1902.

The Thirty-fourth Annual Convention of the Society will be held at Washington, D. C., beginning on Tuesday, May 20th, 1902.

A programme has been arranged and its general features have been indicated in a circular which has been sent to all members.

The general arrangements for the Convention are in the hands of a Committee of the Board of Direction, consisting of the following:

MORDICAI T. ENDICOTT, GEORGE H. PEGRAM,	CHAS. WARREN HUNT.
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The following Local Committee of Arrangements has been appointed by the Board of Direction:

GEORGE W. MELVILLE, <i>Chairman;</i> JOHN BIDDLE, WILLIAM M. BLACK, D. S. CARL ^L , BERNARD R. GREEN, H. M. WILSON.	C. B. HUNT, D. E. McCOMB, ALEXANDER MACKENZIE, ALEXANDER M. MILLER,
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TOPICS FOR INFORMAL DISCUSSION.

The following topics have been selected for discussion:

- Topic No. 1.** "In contract work, either public or private, is it preferable to make separate contracts for the different branches of trades involved, or to combine all under one general contract?"
- Topic No. 2.** "Is it possible and desirable to keep accounts of work in progress in such a manner as to ascertain unit costs on each class of work?"
- Topic No. 3.** "Is steel susceptible of being made as permanent a building material as masonry?"
- Topic No. 4.** "In view of the numerous disasters caused by the contracting of channels, or the damming of small streams, should non-navigable streams be under the control of the National Government?"
- Topic No. 5.** "Should the National Government undertake the construction and operation of irrigation works?"
- Topic No. 6.** "Should Engineering Practice be regulated by a code of ethics? If so, how can such a code be established?"

ACCESSIONS TO THE LIBRARY.

DONATIONS.*

(From March 13th to April 8th, 1902.)

COMPRESSED AIR.

Its Production, Uses and Applications, comprising the Physical Properties of Air from a Vacuum to its Liquid State, its Thermo-Dynamics, Compression, Transmission and Uses as a Motive Power in the Operation of Stationary and Portable Machinery, in Mining, Air Tools, Air Lifts, Pumping of Water, Acids and Oils; the Air Blast for Cleaning and Painting, the Sand Blast and its Work, and the Numerous Appliances in which Compressed Air is a Most Convenient and Economical Transmitter of Power for Mechanical Work, Railway Propulsion, Refrigeration and the Various Uses to which Compressed Air has been Applied. By Gardner D. Hiscox, M. E. Cloth, 10 x 7 ins., 822 pp., portrait, illus. New York, Norman W. Henley & Co., 1901. \$5.00.

The author states in the preface that the practical application of compressed air for doing mechanical work is of so recent date that the design and construction of any of the most useful machines operated by compressed air rest upon empirical rather than scientific formulas. It is one of the objects of the present volume to make available the ascertained facts of experimental research in atmospheric phenomena, and, so far as possible, the fundamental basis upon which such ascertained facts securely rest. In addition to the consideration of the properties of air when simply compressed above the ordinary pressure of the atmosphere, the work includes also a consideration of the properties of air below atmospheric pressure. A large number of illustrations are given to show the salient features of the latest and best designs, including portable machines and individual and special tools for lessening manual labor and increasing the output of work. The work includes a consideration of the hygienic problems involved in caisson work, and the use of compressed air for refrigerating purposes with the physical and thermo-dynamic problems connected therewith.

THE EARNING POWER OF RAILROADS.

With Tables Showing Facts as to Earnings, Capitalization, Mileage, etc., of One Hundred Railroads in the United States and Canada. By Floyd W. Mundy. Cloth, 8 x 5½ ins., 190 pp. New York, Floyd W. Mundy, 1902. \$2.00.

In the introductory remarks it is stated that this volume treats alone and in the most simple and tentative manner of the earning power of railroads, and deals not at all with the traffic resources and the financial and physical condition. It is intended to be a helpful guide to investors. It consists of a number of short chapters on Income Account, Operating Expenses, Maintenance Expenses, Maintenance of Way, Maintenance of Equipment, Conducting Transportation and General Expenses, The Operating Ratio, Fixed Charges, and Stock Outstanding in its Relation to Earning Power, followed by tables and notes relating to specific railroads in the United States and Canada.

THE BLOCK SYSTEM OF SIGNALING ON AMERICAN RAILROADS.

The Methods and Appliances Used in Manual and Automatic Block Signaling, also Descriptions of Hand Operated and Power Operated Interlocking Machines. By Braman B. Adams. Cloth, 9 x 6 ins., 234 pp., illus. New York, *The Railroad Gazette*, 1901. \$2.00.

This book is a revised edition of "American Practice in Block Signaling," issued ten years ago. The matter has been entirely rewritten. Nearly every mechanical or electrical device described in the former work has been improved or superseded, and the bulk of the book is taken up with the numerous modifications and improvements which have been made since 1890. The aim has been to treat the subject from a practical standpoint; to show well-approved practice, rather than ideals or experiments. History is touched upon only incidentally. There have been added brief descriptions of the

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

principal types of interlocking machines used in America. In these descriptions, as in those of the mechanical features of block signaling, the purpose has been to show the methods of working, rather than details of material or construction. The Contents are: The Telegraph Block System, Pennsylvania R. R.; The Telegraph Block System, Erie R. R., Chicago, Burlington & Quincy R. R.; The Telegraph Block System on Single Track, Chicago, Milwaukee & St. Paul Ry.; Single-Track Blocking, Erie R. R., Wabash R. R., Atchison, Topeka & Santa Fé Ry.; The Controlled Manual or "Lock-and-Block" System, New York, New Haven & Hartford R. R.; Controlled Manual, The Electric Train Staff; Automatic Block Signals—Clock-Work Apparatus, Enclosed Disk Signals; Automatic Block Signals on Single-Track, Cincinnati, New Orleans & Texas Pacific Ry.; Electro-Pneumatic Automatic Block Signals; Automatic Block Signals—The Electric Semaphore; Three-Position Automatic Block Signals, Pittsburgh, Fort Wayne & Chicago Ry.; Conclusions, Statistics; The Saxby and Farmer Interlocking Machine; The Johnson Interlocking Machine; The Westinghouse Electro-Pneumatic Machine; The Low-Pressure Pneumatic Machine; The Taylor Electric Machine. There is an index of four pages.

PRACTICAL CALCULATION OF DYNAMO-ELECTRIC MACHINES.

A Manual for Electrical and Mechanical Engineers and a Text-Book for Students of Electrical Engineering, Continuous Current Machinery. By Alfred E. Wiener, M. A. I. E. E. Second Edition, Revised and Enlarged. Cloth, 9 $\frac{1}{2}$ x 6 $\frac{1}{2}$ ins., 36 + 727 pp., illus. New York, *Electrical World and Engineer*, 1902. \$3.00.

It has been the aim of the author in preparing this volume to develop an entirely practical treatise on dynamo-calculation, the treatment of the subject being based upon results obtained in practice and therefore giving such practical experience. There are more than a hundred original tables and nearly five hundred formulas derived from the data and tests of over two hundred modern dynamos of American as well as English make. Although intended as a text-book for students and a manual for practical dynamo designers, it is believed that any one possessing a fundamental knowledge of arithmetic and algebra will be able, by means of this work, successfully to calculate and design any kind of a continuous-current dynamo. The formulas are so prepared that the results are obtained in inches, feet, pounds, etc., but the tables are given both for the English and metric systems. The Contents are: Physical Principles of Dynamo-Electric Machines; Calculation of Armature; Calculation of Magnetic Flux; Dimensions of Field-Magnet Frame; Calculation of Magnetizing Force; Calculation of Magnet Winding; Efficiency of Generators and Motors; Designing of a Number of Dynamos of Same Type; Calculation of Electric Motors, Unipolar Dynamos, Motor-Generators, etc., and Dynamo Graphics; Practical Examples of Dynamo Calculation; Tables of Dimensions of Modern Dynamos; Wire Tables and Winding Data; Localization and Remedy of Troubles in Dynamos and Motors in Operation. There is an index of twenty-three pages.

ELECTRIC GAS LIGHTING.

How to Install Electric Gas Igniting Apparatus Including the Jump-Spark and Multiple Systems for Use in Houses, Churches, Theatres, Halls, Schools, Stores or any Large Buildings; also the Care and Selection of Suitable Batteries; Wiring and Repairs. By H. S. Norrie (Norman H. Schneider). Cloth, 6 $\frac{1}{2}$ x 5 ins., 8 + 101 pp., illus. New York, Spon & Chamberlain, 1901. \$0.50.

The preface states that the object of this book is to enable any one possessing ordinary mechanical ability to construct much of the apparatus used for igniting gas by electricity, or at least to successfully erect it and keep it in operation, as it requires no very complicated devices, nor does it necessitate deep knowledge of electrical matters for its installation. The Contents are: Introductory Remarks; Multiple Gas Lighting; Connections and Wiring; Primary Coils and Safety Devices; Lighting of Large Buildings; How to Select Batteries for Gas Lighting. There is an index of three pages.

WATER-TUBE BOILERS.

Based on a Short Course of Lectures Delivered at University College, London. By Leslie S. Robertson, M. Inst. C. E. Cloth, 9 x 6 ins., 15 + 213 pp., illus. New York, D. Van Nostrand Company, 1901. \$3.00.

The author states in the preface that the issue of this book in its present form is due to the want of a short practical work of reference on water-tube boilers for students and engineers; that it has retained, more or less, the form of the lectures, but that they have been revised and adapted as far as possible to their present purpose. No attempt has been made to deal with the subject exhaustively or in great detail, the scope hav-

ing been confined to the following topics: 1. An historical description of the better-known types of tubulous boilers, from the early attempts to the present day. 2. The consideration of the general principles underlying the construction of steam boilers, but dealing with them only in so far as they immediately concern water-tube boilers. 3. A discussion of the principles underlying the circulation of the water and the hot gases. 4. Short description of the better-known types of water-tube boilers. 5. Boiler mountings and accessories. 6. Weight and space occupied. 7. Advantages and disadvantages of this type of boiler. An appendix gives the Interim Report of the Committee, appointed by the Lords Commissioners of the Admiralty, to consider certain questions respecting modern types of boilers for naval purposes. There is an index of nine pages.

SOME DETAILS OF WATER-WORKS CONSTRUCTION.

By William R. Billings. Third Edition. Cloth, 9 x 6 ins., 96 pp., illus. New York, *The Engineering Record*, 1898. \$2.00.

The present volume consists of a series of articles which were originally published in *The Engineering Record*. The writer states that he has endeavored to be brief and practical, having especially in mind those who have had little or no experience in actual construction and who desire information and suggestion upon the simplest details. The headings of chapters are: The Distributing System; Field Work; Trenching and Pipe-Laying; Pipe-Laying and Joint-Making; Hydrants, Gates, and Specials; Service-Pipes; Service-Pipes and Meters; Notes on the Construction of about Two Miles of 16-Inch Water-Main; Tables of Cost.

FURNACE DRAFT.

Its Production by Mechanical Methods. By William Wallace Christie, M. Am. Soc. M. E. Cloth, 6 x 4 ins., 44 pp., illus. Published by the Author, Paterson, N. J., 1901. \$0.50.

In presenting this monograph to the public the author has made no claim for its completeness nor for his infallibility, but only that he has given to the reader some facts concerning mechanical draft in a convenient form for ready reference. Some of the material has already appeared in the *Engineering Magazine*. There is an index of two pages.

PLANE SURVEYING.

A Text and Reference Book for the Use of Students in Engineering and for Engineers Generally. By Paul C. Nugent. Cloth, 9 x 6 ins., 16 + 577 pp., 6 plates, illus. New York, John Wiley & Sons, 1902. \$3.50.

The arrangement of the topics in this work is in the order in which it has seemed easiest to teach them, due regard being had to completeness under each head, rather than by classification under the subdivisions of the subject. Special attention is called to the treatment of the adjustments of instruments by the methods of descriptive geometry, the chapter on telescopes, and the forms for systematic arrangement of computations. The Contents are: Introduction; Linear Measuring Instruments and Range Poles; Chain Surveying; Compass and General Surveying; The Telescopes of Surveying Instruments; Leveling; Transit Surveying; The Planimeter and the Slide Rule; Topographical Surveying; Hydrographic Surveying; Mine Surveying; The Solar Instruments; The U. S. Public Lands.—Resurveys; Problems; The Cyclotomic Transit; The Restoration of Lost or Obliterated Corners and Subdivision of Sections; Photo-topographic Methods and Instruments. There is an index of five pages.

SEWAGE AND THE BACTERIAL PURIFICATION OF SEWAGE.

By Samuel Rideal. Second Edition. Cloth, 9 x 6 ins., 2 + 308 pp., illus. New York, John Wiley & Sons, 1901. \$3.50.

The author has endeavored to treat this subject from the view point that all schemes for the purification of sewage by bacterial processes must be based upon the theory of the bacterial changes, so far as they have been studied. In preparing the second edition, the entire work has been revised, and much further knowledge added, both in theory and practice, of the remarkable development of bacterial treatment of sewage. Parts of the earlier edition have been condensed to make room for fresh matter, as the aim has been to convey in a small space as much information as possible. The Contents are: Characters of Sewage, and Primary Methods of Disposal; Chemical Analyses of Sewage and Effluents; Bacteria Occurring in Sewage; Chemical Changes Produced by Bacteria; Irrigation and Sewage Farms; Subsidence and Chemical Precipitation; Sterilization; Bacterial Purification; Agricultural Value of Bacterial Effluents; Distribution and Distributors; Trade Effluents. There is an index of twelve pages.

REVIEW AND TEXT OF THE AMERICAN STANDARD SPECIFICATIONS FOR STEEL.

Adopted in August, 1901, by the American Section of the International Association for Testing Materials. By Albert Ladd Colby, Member of Committee No. 1 of American Section of the I. A. T. M. Second Edition, Rewritten and Containing the Revised Text of the Standard Specifications. Cloth, 7 x 5 ins., 103 pp. Easton, Pa., The Chemical Publishing Company, 1902. \$1.10. (Donated by the Author.)

The introduction states that in drawing up these standard specifications the Committee was conservative, and included, in the main, only such requirements as has been proved in practice to be of value or essential in determining whether or not the material is suited for the purpose intended. The specifications were adopted as representing the American practice of to-day. They are not intended to cover every specific purpose, but it is believed that they will serve for the majority of uses to which steel is applied, and that they can be modified to suit particular requirements without departing materially from the standard form and practice recommended. In addition to the text of the specifications, the work contains the reasons governing the Committee in its decisions.

WATER AND WATER SUPPLIES.

By John C. Thresh. Third Edition, Revised and Enlarged. Cloth, 8 x 5 ins., 15 + 527 pp., illus. Philadelphia, P. Blakiston's Son & Co., 1901. \$2 00.

The main object of this work is to place within the reach of those interested in public health the information requisite for forming an opinion as to whether any supply or proposed supply of water is sufficiently wholesome and abundant, and whether the cost is reasonable. It does not pretend to be a treatise on Engineering, yet it is hoped that it contains sufficient detail to enable anyone to consider intelligently any scheme for supplying a community with water. The author has embodied in various chapters the experience gained in large rural districts where his schemes have been carried to a successful completion. The last chapter gives a brief *résumé* of the law relating to water supplies. The chapter headings are: Water, Its Composition, Properties, etc.; Rain and Rain Water; Surface Water; Subsoil Water; Natural Spring Water; Deep-Well Waters; River Water; Quality of Drinking Waters; Impure Water and Its Effect upon Health; The Interpretation of Water Analyses; The Pollution of Drinking Water; The Self-Purification of Rivers; The Purification of Water on the Large Scale; Domestic Purification; The Softening of Hard Water; Quantity of Water Required for Domestic and Other Purposes; Selection of Sources of Water Supply and Amount Available from Different Sources; The Protection of Underground Water Supplies; The Protection of Surface-Water Supplies; Wells and Their Construction; Pumps and Pumping Machinery; The Storage of Water; The Distribution of Water; The Law Relating to Water Supplies; Rural and Village Water Supplies; Water Charges. There is an index of twenty-nine pages.

SHOP AND ROAD TESTING OF DYNAMOS AND MOTORS.

A Practical Manual for the Testing Floor, the Car Barn and the Road. By Eugene C. Parham and John C. Shedd. Cloth, 8 x 6 ins., 12 + 627 pp., illus. New York, *Electrical World and Engineer*, 1901. \$2.50.

This work has a two-fold object: I. To give a complete theory of the commercial testing floor, so far as it relates to direct current machines, and of the applications of theory to practice. II. To meet the demand on the part of operating companies for a manual that shall enable them to do their own repair work and consequent testing. The first part of the book is devoted to such fundamental and preliminary conceptions as are needed to help those unacquainted with the general theory. The second part treats of the testing and use of instruments. The third part takes up in detail the tests of dynamos and motors. All examples and illustrations are taken from personal experience. In this, the second edition, the scope of the work has been extended to include street-car equipment and operation. The authors have endeavored in this to be strictly practical and at the same time to aid the reader in obtaining a comprehensive grasp of the principles involved. The headings of chapters are: Elements of the Dynamo; Elements of the Motor; Ohm's Law; Measurement of Current; Measurement of Electromotive Force; Measurement of Resistance; Measurement of Insulation; The Series Machine; Shunt and Compound-Wound Machine; The Compound-Wound Machine—General Tests; Compounding; Miscellaneous Tests; Grounds on the Line; Motor Testing; Installation Car Equipment Tests; Car Equipment Tests. There is an index of seven pages.

The following gifts have also been received:

- Alexandria, Ind., City Civ. Engr. 1 specif.
 Am. Soc. of Mech. Engrs. 1 pam.
 Assoc. Amicale des Anciens Élèves de l'École Centrale des Arts et Manufactures. 1 vol.
 Bay City, Mich., Board of Water-Works. 1 pam.
 Boston & Albany R. R. Co. 5 pam.
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 Hayes, John. 1 pam.
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 Hocking Valley Ry. Co. 6 pam.
 Ill. Agricultural Exper. Station. 1 pam.
 Johnstown, N. Y., Board of Water Comms. 1 pam.
Journal of Gas Lighting. 30 nos.
 Keating, Edward H. 1 pam.
 Lansing, E. Ten Eyck. 1 pam.
 Lathbury, B. B. 1 bound vol.
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 Yale Univ. 1 vol.
 Yazoo & Mississippi Valley R. R. Co. 2 pam.
 Yonkers Board of Water Comms. 1 pam.
 Unknown donor. 1 pam.

BY PURCHASE.

Outlines of Electrochemistry. By Harry C. Jones. New York, The Electrical Review Publishing Co., D. Van Nostrand Company, 1901.

Practical Marine Engineering for Marine Engineers and Students, with Aids for Applicants for Marine Engineers' Licenses. By William F. Durand. New York, Marine Engineering, Inc., 1901.

Machines à Vapeur et Machines Thermiques Diverses. Par J. Dejust. Paris, Ch. Dunod, 1899.

Directory to the Iron and Steel Works of the United States, Embracing a Full List of the Blast Furnaces, Rolling Mills, Steel Works, Ball Mills, Structural Mills, Plate and Sheet Mills, Steel Casting Works, Tinplate Works, Wire-Rod Mills, Cut-Nail Works, Wire-Nail Works, and Forges and Bloomeries, with Full Particulars of Equipment, Products, Ownership, Officers, and All Recent Consolidations, to Which is Added a Complete List of the Iron and Steel Works of Canada. Compiled and Published by The American Iron and Steel Association. Fifteenth Edition. Corrected to December 31, 1901. Philadelphia, The American Iron and Steel Association, 1901.

Statistics of the American and Foreign Iron Trades for 1897, 1899 and 1900; Annual Statistical Report of the American Iron and Steel Association, Containing Complete Statistics of the Iron and Steel Industries of the United States for 1897, '99 and 1900 and Preceding Years; also Statistics of the Iron Ore, Coal, Coke, and Shipbuilding Industries of the United States, and of Imports and Exports of Iron and Steel and Iron Ore. 3 vols. Philadelphia, The Iron and Steel Association, 1898-1900.

The Anthracite Coal Industry, a Study of the Economic Condition and Relations of the Coöperative Forces in the Development of the Anthracite Coal Industry of Pennsylvania. By Peter Roberts. With an Introduction by W. G. Sumner. New York, The Macmillan Company; London, Macmillan & Co., Ltd., 1901.

A New Pronouncing Dictionary of the Spanish and English Languages. Compiled by Mariano Velázquez de la Cadena. Revised and Enlarged by Edward Gray and Juan L. Iribas. First Part: Spanish-English. New York, D. Appleton & Company, 1901.

Handbuch der Ingenieurwissenschaften. Vol. 1, pt. 5. Leipzig, Wilhelm Engelmann, 1902.

United States Official Postal Guide, January, 1902. Philadelphia, George F. Lasher, 1902.

International Railway Congress. Sixth Session. Paris, September, 1900. Proceedings (English Edition.) Vol. 1-2. Brussels, P. Weissenbruch, 1901.

Beitrag, zum derzeitigen Stande der Abwasserreinigungsfrage mit besonderer Berücksichtigung der biologischen Reinigungsverfahren. Von Prof. Dr. Dunbar, Dr. K. Thumm. München und Berlin, R. Oldenbourg, 1902.

SUMMARY OF ACCESSIONS.

March 13th to April 8th, 1902.

Donations (including 3 duplicates and 57 numbers, completing volumes of periodicals).....	356
By purchase.....	12
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Total.....	368

MEMBERSHIP.**ADDITIONS.****MEMBERS.**

		Date of Membership.
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HOWARD, JOHN LEWIS, Div. Engr., Metropolitan Water and Sewerage Board, 1 Ashburton Pl., Boston, Mass.	{ Assoc. M. M.	Dec. 7, 1898 April 2, 1902
LUSTER, WILLIAM HENRY, Jr., City Surv., City Hall, Elizabeth, N. J.	{ Assoc. M. M.	Oct. 3, 1900 April 2, 1902
SIMSON, DAVID, Gen. Mgr., Buenos Aires Western Ry., Casilla No. 741, Buenos Aires, Argentine Republic		Jan. 8, 1902
WATT, JOHN MARSHALL GILKISON, U. S. Engr. Office, Chattanooga, Tenn.		Feb. 5, 1902

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DERLETH, CHARLES, Jr., Prof. of Civ. Eng., State Univ. of Colorado, Boulder, Colo.	{ Jun. Assoc. M.	Feb. 1, 1898 March 5, 1902
FAY, FREDERIC HAROLD, Asst. Engr., Eng. Dept., 60 City Hall, Boston, Mass.	{ Jun. Assoc. M.	Oct. 2, 1894 April 2, 1902
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Pa.
WILCOX, CLARK LUZERNE. Care, Waring, Chapman & Farquhar,
874 Broadway, New York City.

DEATHS.

CHEENEY, NATHANIEL Elected Fellow June 21st, 1870; died
June 29th, 1901.
DEL MONTE, EMILIO Elected Member Dec. 4th, 1895; died
March 20th, 1902.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(March 13th to April 8th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal*, Assoc. Eng. Soc., 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings*, Eng. Club of Phila., 1122 Girard St., Philadelphia, Pa.
- (3) *Journal*, Franklin Inst., Philadelphia, Pa., 50c.
- (4) *Journal*, Western Soc. of Eng., Monadnock Block, Chicago, Ill.
- (5) *Transactions*, Can. Soc. C. E., Montreal, Que., Can.
- (6) *School of Mines Quarterly*, Columbia Univ., New York City, 50c.
- (7) *Technology Quarterly*, Mass. Inst. Tech., Boston, Mass., 75c.
- (8) *Stevens Institute Indicator*, Stevens Institute, Hoboken, N. J., 50c.
- (9) *Engineering Magazine*, New York City, 30c.
- (10) *Cassier's Magazine*, New York City, 25c.
- (11) *Engineering* (London), W. H. Wiley, New York City, 35c.
- (12) *The Engineer* (London), International News Co., New York City, 35c.
- (13) *Engineering News*, New York City, 15c.
- (14) *The Engineering Record*, New York City, 12c.
- (15) *Railroad Gazette*, New York City, 10c.
- (16) *Engineering and Mining Journal*, New York City, 15c.
- (17) *Street Railway Journal*, New York City, 35c.
- (18) *Railway and Engineering Review*, Chicago, Ill.
- (19) *Scientific American Supplement*, New York City, 10c.
- (20) *Iron Age*, New York City, 10c.
- (21) *Railway Engineer*, London, England.
- (22) *Iron and Coal Trades Review*, London, England.
- (23) *Bulletin*, American Iron and Steel Assoc., Philadelphia, Pa.
- (24) *American Gas Light Journal*, New York City, 10c.
- (25) *American Engineer*, New York City, 20c.
- (26) *Electrical Review*, London, England.
- (27) *Electrical World and Engineer*, New York City, 10c.
- (28) *Journal*, New England Water-Works Assoc., Boston, 75c.
- (29) *Journal*, Society of Arts, London Engiland.
- (30) *Annales des Travaux Publics de Belgique*, Brussels, Belgium.
- (31) *Annales de l'Assoc. des Ing. Sortis des Ecole Spéciales de Gand*, Brussels, Belgium.
- (32) *Mémoires et Compte Rendu des Travaux*, Soc. Ing. Civ. de France, Paris, France.
- (33) *Le Génie Civil*, Paris, France.
- (34) *Portefeuille Économique des Machines*, Paris, France.
- (35) *Nouvelles Annales de la Construction*, Paris, France.
- (36) *La Revue Technique*, Paris, France.
- (37) *Revue de Mecanique*, Paris, France.
- (38) *Revue Générale des Chemins de Fer et des Tramways*, Paris, France.
- (39) *Railway Master Mechanic*, Chicago, Ill.
- (40) *Railway Age*, Chicago, Ill., 10c.
- (41) *Modern Machinery*, Chicago, Ill., 10c.
- (42) *Transactions*, Am. Inst. Elec. Eng., New York City, 50c.
- (43) *Annales des Ponts et Chaussées*, Paris, France.
- (44) *Journal*, Military Service Institution, Governor's Island, New York Harbor, 75c.
- (45) *Mines and Minerals*, Scranton, Pa., 20c.
- (46) *Scientific American*, New York City, 10c.
- (47) *Mechanical Engineer*, Manchester, England.
- (48) *Proceedings*, Eng. Soc. W. Pa., 410 Penn Ave., Pittsburg, Pa., 50c.
- (49) *Transactions*, Mining Institute of Scotland, London and Newcastle-upon-Tyne.
- (50) *Municipal Engineering*, Indianapolis Ind., 25c.
- (51) *Proceedings*, Western Railway Club, 225 Dearborn St., Chicago, Ill., 25c.
- (52) *American Manufacturer and Iron World*, 59 Ninth St., Pittsburg, Pa.
- (53) *Minutes of Proceedings*, Inst. C. E., London, England.
- (54) *Power*, New York City, 10c.
- (55) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.
- (56) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.

Bridge.

- Formulae for the Weights and Economic Depths of Plate Girders. Alfred Fyson, M. Inst. C. E. (11) Serial beginning Mar. 14.
 A New Type of Concrete-Steel Arch Culvert or Bridge.* Daniel B. Lnten. (18) Mar. 15.
 The Interprovincial Cantilever Bridge at Ottawa, Ont.* (18) Mar. 15.
 Plate Girder Webs. T. Graham Gribble, Assoc. M. Inst. C. E. (62) Mar. 20.
 The New Ferry Bridge Across the Ship Canal at Duluth, Minn.* W. B. Patton. (13) Mar. 20.
 The Highland Park Bridge, Pittsburg.* (14) Mar. 22.
 Iron and Steel Structures. (From Committee Report, Amer. Ry. Eng. and M. of W. Assoc.) (18) Mar. 22.
 High Concrete Piers for Railway Bridge Across Stone's River; Tennessee Central Ry.* (13) Mar. 27.
 Concrete-Steel Arch Y-Bridge at Zanesville, O.* (13) Mar. 27.
 The Chesapeake & Ohio Railroad Bridge at Richmond, Va.* (14) Mar. 29.
 Notes sur la Construction du Viaduc du Viaur (Ligne de Carmaux à Rodey). M. Théry. (43) 3^e Trimestre, 1901.
 Conference sur l'Experimentation des Ponts. M. Rabut. (43) 3^e Trimestre, 1901.

Electrical.

- The Construction of High Tension Central Station Switch-Glass. Henry W. Clothier, A. M. I. C. E. (Paper read before Inst. of Elec. Engrs., Manchester Section.) (26) Serial beginning Mar. 7.
 Electric Power in the Manufacture of Shale Oil. (11) Mar. 14.
 Frankfort Electricity Works.* (26) Mar. 14.
 The Transmission System of the Compania Explotadora de San Ildefonso of the City of Mexico. (27) Serial beginning Mar. 15.
 Efficiencies of Electric Cranes. (47) Mar. 15.
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AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PAPERS AND DISCUSSIONS.

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A PROPOSED NEW TYPE OF MASONRY DAM.

By GEORGE L. DULLMAN, M. Am. Soc. C. E.

TO BE PRESENTED JUNE 4TH, 1902.

Strains in masonry dams have been analyzed by many investigators, so that definite requirements must be fulfilled before any proposed plan will receive consideration by the engineering profession. These may be stated briefly as follows :

- 1.—The dam must not overturn.
- 2.—The dam must not sustain an intensity of pressure beyond a safe and known limit.
- 3.—The dam must not slide on its base.
- 4.—No possible condition must develop tension in any part of the masonry.

It is the purpose of this article to suggest a new type of dam, according to these requirements, so far as they are reasonable, which will contain less masonry, for the same factors of safety, than any of the recognized "standard types."

The theory on which all investigators, from Sazilly to Wegmann, have based their profile sections is that, the stability of one section being proven, a uniform construction to that section would insure the stability of the whole. While this is unquestionably true, it does not

NOTE.—These papers are issued before the date set for presentation and discussion. Correspondence is invited from those who cannot be present at the meeting, and may be sent by mail to the Secretary. Discussion, either oral or written, will be published in a subsequent number of *Proceedings*, and, when finally closed, the papers, with discussion in full, will be published in *Transactions*.

follow that uniformity of section is necessary to stability. The writer will strive to show in this article that a more stable and economical dam can be built in the form of a buttressed wall, properly proportioned; or, the proposed type can be considered as a series of short, arched dams between piers shaped so as to be economical of material, and with sufficient factors of safety.

There is a principle in hydraulic construction which is too frequently ignored. It is, to construct one water-tight surface and build the remainder of the structure to support that surface. The attempt to stop leakage that has gotten through such a surface is frequently a cause of failure. If there is leakage or seepage through the upper face of a dam of any of the standard types, the formulas for stability are founded on error. The upper face must be tight, or the computed line of pressure, when the reservoir is full, is wrong. John D. Van Buren, M. Am. Soc. C. E., recognized that seepage under the foundation would also upset the calculations of the analysts of the "standard type" dams, but proposed as a remedy another uniform-section type, very much heavier than any of them.*

While these criticisms also apply to the proposed type, the comparatively thin parts allow this seepage through the upper face to escape before penetration beyond a known point in the masonry, and the seepage under the foundation can escape between the buttresses without exerting a dangerous upward pressure on the base. In either case, the point of leakage can be more easily located.

The writer does not want to be understood as advocating leaky dams; but, as most of the dams in the world are leaky, the possibility of leaks should not be neglected, and their possible effects should be reckoned with.

Infinite variety may result in the application of these principles. One computation will be made here to show the method and the simplicity of the mathematics involved. The solution of no equations above simple ones is necessary. The portions between buttresses will be made parabolic in horizontal section, which will avoid all re-entrant angles, introduce the strongest arch to support the greatest pressure, and, finally, be easier of computation than any other form known to the writer. The crest will be made one-tenth of the height, to agree with the crests of "standard types," approximately. The up-stream

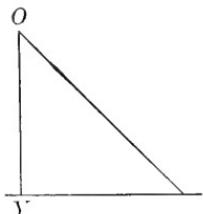
face will be vertical, though no more intricate mathematics is involved by giving it a batter. The line of the arch vertices will be vertical, though a batter to this and the up-stream face would result in additional economy of material. The profile of the buttress faces will be 1 to 1, or 45° . The width of the buttresses at the face will be battered uniformly from the crest, the amount of batter being a matter of computation.

DEDUCTION OF FORMULAS.

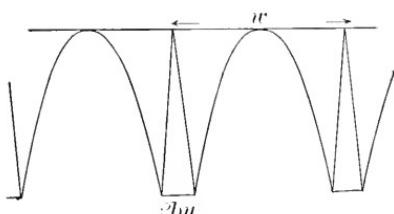
Let w = length of one section of the dam, from center to center of buttresses;

Let y = depth from crest, or height of dam;

Let b = buttress batter, so that $2by$ = width of buttress. Consider the buttresses first (see Figs. 1 and 2).



SECTION THROUGH BUTTRESS.



PLAN OF BUTTRESSES.

FIG. 2.

Area of Horizontal Section.

$$A = w y - \frac{2}{3} y (w - 2 b y) = \frac{1}{3} w^2 y + \frac{4}{3} b y^2 = \frac{y}{3} (w + 4 b y) \dots (1)$$

Volume from Crest,

$$V = \int^y A \, dy = \frac{w}{3} \int y \, dy + \frac{4}{3} b \int y^2 \, dy = \frac{y^2}{18} (3w + 8b). \quad (2)$$

Center of Gravity of Horizontal Area from OY (see Fig. 1).

Take moments about OY . Let x = the distance of the center of gravity from OY .

$$x A = w y \times \frac{y}{2} - \frac{3}{5} y \times \frac{2}{3} y (w - 2 b y) = \frac{y^2}{10} (w + 8 b y)$$

$$x = \frac{3y}{10} \times \frac{w + 8 b y}{w + 4 b y} \dots \dots \dots (3)$$

Center of Gravity of Volume from OY.

$$\begin{aligned} \text{Distance } V &= \int_a^y A \cdot x \, dy = \int_{\frac{y}{3}}^y (w + 4b)y \frac{3}{10} y \times \frac{w + 8b}{w + 4b} y \, dy \\ &= \frac{w}{10} \int y^2 \, dy + \frac{4b}{5} \int y^3 \, dy = \frac{y^3}{30} (w + 6by) \end{aligned}$$

Now add a face to this pier or buttress, of uniform thickness, $\frac{y}{10}$. Its volume is $\frac{w y^2}{10}$. Its center of gravity is $\frac{y}{20}$ up stream from $O Y$.

Center of Gravity of Face and Buttress, Horizontally from O Y.

Take moments about OY .

$$\text{Distance} = \frac{\frac{y^3}{30} (w + 6 b y) - \frac{w y^3}{200}}{\frac{y^2}{18} (3 w + 8 b y) + \frac{w y^2}{10}} = \frac{3 y}{160} \times \frac{17 w + 120 b y}{3 w + 5 b y} \quad \dots(7)$$

This is down stream from the up-stream toe a distance

The weight of masonry is its volume multiplied by its specific gravity. For purposes of comparison, the specific gravity assumed will be the same as that used by Edward Wegmann,* M. Am. Soc. C. E., *i. e.*, $2\frac{1}{2}$.

$$\text{Total weight} = W = -\frac{28y^2}{135}(3w + 5by). \dots \dots \dots (9)$$

(Both (9) and (10) are in terms of cubic feet of water.)

The Resultant of Forces.—When the reservoir is full, the resultant of forces is of the form $z = m r + c$, where z and r are the usual co-ordinates (except that z is positive downward), m is a tangent of direction and is equal to $\frac{W}{P}$, and c is a constant. (See Fig. 3.)

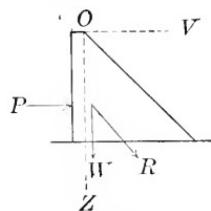


FIG. 3.

Equation (7)],

$$\text{thus, } c = \frac{y}{900w}(481w - 840by).$$

and the equation to the resultant becomes

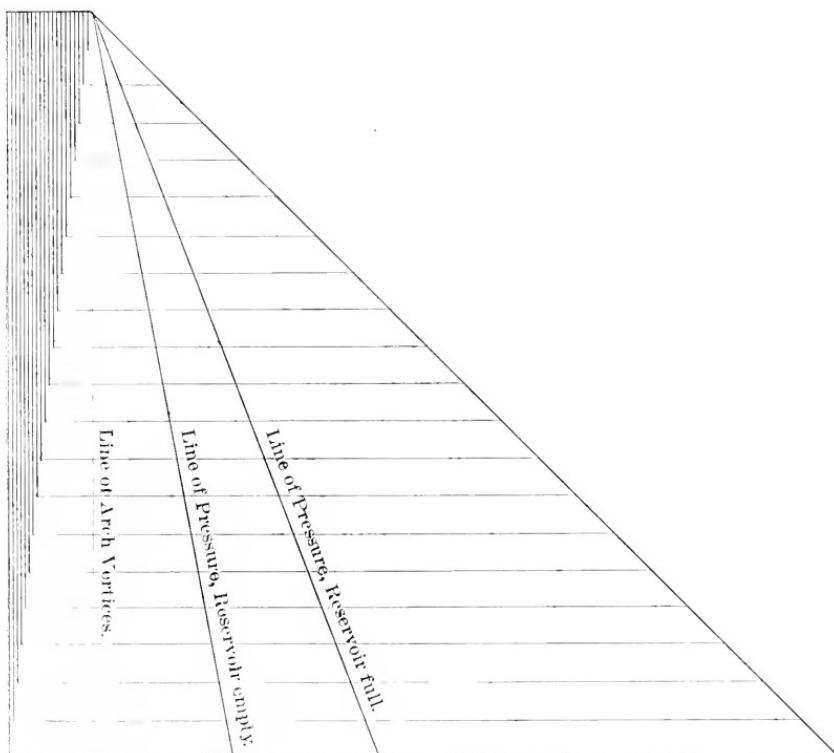
$$z = \frac{56}{135} \frac{v}{w} (3vw + 5by) + \frac{y}{900} \frac{w}{v} (481w - 840by). \dots \dots \dots (11)$$

* "The Design and Construction of Dams, Including Masonry, Earth, Rock-fill, and Timber Structures, also the Principal Types of Movable Dams," Fourth edition, 1899.

This intersects the base, $z = y$, at

This is up stream from the down-stream toe a distance

$$= y \frac{(2103 w + 3080 b y)}{1120 (3 w + 5 b y)} \dots \dots \dots (13)$$



SECTIONS THROUGH BUTTRESSES OF DAMS FROM 10 TO 200 FT. IN HEIGHT,
SHOWING LINES OF PRESSURE.

FIG. 4.

Intensity of Pressure.—With both dam and foundation rigid, the intensity of pressure at either toe is the average pressure multiplied by the fraction the numerator of which is four times the width of the base minus six times the distance of the center of pressure from the toe, and the denominator of which is the width of the base. In this case, it applies to the up-stream toe, but the factor $\frac{w}{2bg}$ must be

applied to the lower toe, because the pressure is borne on a length of toe $= 2 b y$, instead of w . The average intensity of pressure is the weight divided by the base, or

$$I_{av.} = \frac{56 y}{297 w} (3 w + 5 b y) \dots \dots \dots (14)$$

When the reservoir is empty, the intensity of pressure at the upper toe is

$$I_{max.} = \frac{7 y}{3267 w} (759 w + 1412 b y) \dots \dots \dots (15)$$

When the reservoir is full, the intensity of pressure at the lower toe is

$$I_{max.} = \frac{1083 w + 3080 b y}{6534 b} \dots \dots \dots (16)$$

With these formulas, by substituting any desired value for the maximum intensity of pressure, the ratio $\frac{w}{b}$ can be obtained. w should be taken to make a good proportion with the height of the structure, then b can be calculated. These weights and pressures are all given in terms of cubic feet of water, so that the maximum intensities should be in the same units.

Sliding on the Base.—The angle of the resultant with the vertical is the angle of friction necessary to stability. Call this angle a . Then $\tan. a$ is the coefficient of friction necessary to prevent sliding on any horizontal base. Or, [see equations (9), (10) and (11)],

$$f = \tan. a = \frac{P}{W} = \frac{1}{m} \dots \dots \dots (17)$$

Explanation of Table No. 1.

For reasons given below, $\frac{w}{b}$ will be taken as 1000 in Table No. 1. Equation (2) gives the volume of a buttress. This, added to the face, $\frac{w y^2}{10}$, is the volume of the dam for a length w , so that the volume per foot of length will be

$$\frac{r}{w} = \frac{y^2}{18} \left(3 + 8 y \frac{b}{w} \right) + \frac{y^2}{10} = \frac{y^2}{2250} (600 + y).$$

Column 2 of Table No. 1 gives this.

Equation (16) gives the intensity of pressure at the lower toe when the reservoir is full. When $\frac{w}{b}$ is 1000, this becomes, in tons of 2000 lbs., $\frac{135\,375 + 385 y}{26\,136}$, given in Column 3.

The formula for maximum intensity of pressure when the reservoir is full (taken, so far, to agree with Wegmann's hypothesis), is

only the vertical component of that intensity. The actual pressure is the weight multiplied by sec. α (see Equation 17), and is borne on a base which is the base so far considered multiplied by cos. α . Thus, the intensity of pressure as above computed should be multiplied by the square of sec. α for the actual intensity of pressure. This is given in Column 4.

Equation (15) gives the intensity of pressure at the upper toe when the reservoir is empty. When $\frac{w}{b}$ is 1000, this becomes, in tons of 2000 lbs., $\frac{7y(189750 + 353y)}{26136000}$, which is given in Column 5.

The distance from the lower toe to the point on the base cut by the resultant of weight and pressure is given by Equation (13). When $\frac{w}{b}$ is 1000, this becomes, in feet, $\frac{y(52575 + 77y)}{140(600 + y)}$, which is given in Column 6.

Similarly, the horizontal distance of the upper toe from the center of gravity is given by Equation (8). When $\frac{w}{b} = 1000$, this becomes, in feet, $\frac{11y(225 + y)}{20(600 + y)}$, which is given in Column 7.

TABLE No. 1.

y , in feet.	Volume per foot, in cubic feet.	MAXIMUM PRESSURE, IN TONS PER SQUARE FOOT.			DISTANCE FROM TOE TO CENTER OF PRESSURE.			Coefficient of friction, tan. α .	Factor against overturning.		
		Full.	Multi- plied by sec. ² α .	Empty.	Full.	Empty.					
				(5)		(8)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)			
10	27.1	5.32	8.64	0.52	6.24	2.12	0.7904	3.34			
20	110.2	5.47	8.78	1.05	12.47	4.35	0.7776	3.34			
30	252.0	5.62	8.91	1.61	18.67	6.68	0.7553	3.35			
40	455.1	5.76	9.03	2.18	24.85	9.11	0.7334	3.35			
50	722.2	5.91	9.16	2.77	31.00	11.64	0.7118	3.35			
60	1056.0	6.06	9.30	3.38	37.14	14.25	0.6905	3.36			
70	1459.1	6.20	9.44	4.02	43.26	16.95	0.6796	3.36			
80	1934.2	6.35	9.57	4.66	49.35	19.73	0.6690	3.36			
90	2484.0	6.50	9.69	5.33	55.44	22.60	0.6587	3.37			
100	3111.1	6.65	9.80	6.02	61.51	25.53	0.6488	3.37			
110	3818.2	6.79	9.92	6.72	67.55	28.55	0.6391	3.37			
120	4608.0	6.94	10.04	7.45	73.59	31.62	0.6296	3.38			
130	5483.1	7.09	10.18	8.19	79.61	34.77	0.6105	3.38			
140	6446.2	7.23	10.30	8.95	85.62	37.98	0.6015	3.38			
150	7500.0	7.38	10.43	9.73	91.61	41.25	0.6428	3.39			
160	8647.1	7.53	10.56	10.53	97.59	44.58	0.6344	3.39			
170	9890.2	7.68	10.69	11.35	103.55	47.96	0.6262	3.39			
180	11232.0	7.82	10.81	12.19	109.51	51.40	0.6181	3.40			
190	12675.1	7.97	10.93	13.02	115.46	54.99	0.6103	3.40			
200	14222.2	8.12	11.07	13.92	121.39	58.44	0.6027	3.40			

Column 8 gives the coefficient of friction necessary to stability. See Equation (17).

The factor of safety against overturning is $\frac{W \text{ by its arm}}{P \text{ by its arm}}$, which, with these assumptions, becomes $3.3367 + 0.0034 y$, being always more than 3.33, and increasing slightly with the height of the dam. This is given in Column 9.

By permission of Mr. Edward Wegmann, some of his figures will be given for comparison. Where possible, his hypotheses have been adopted with this in view. $\frac{w}{h}$ has been taken as 1 000 to agree with his maximum intensity of pressure for a 200-ft. dam.

TABLE No. 2.

50-FOOT DAM.	WEGMANN'S No. 1.	PROPOSED DAM.
Height.....	50 ft.	50 ft
Crest.....	5 "	5 "
Specific gravity of masonry.....	2.33	2.33
Volume per foot of length.....	830.7 cu. ft.	722.2 cu. ft.
Maximum pressure, reservoir full.....	3.58 tons.	5.91 tons.
" " " empty.....	3.67 "	2.77 "
Coefficient of friction necessary.....	0.64	0.74
Coefficient against overturning.....	2.00	3.45

100-FOOT DAM.	WEGMANN'S No. 2.	PROPOSED DAM.
Height.....	100 ft.	100 ft.
Crest.....	10 "	10 "
Specific gravity of masonry.....	2.33	2.33
Volume per foot of length.....	3322.7 cu. ft.	3111.1 cu. ft.
Maximum pressure, reservoir full.....	7.16 tons.	6.65 tons
" " " empty.....	7.33 "	6.02 "
Coefficient of friction necessary.....	0.64	0.69
Coefficient against overturning.....	2.00	3.38

200-FOOT DAM.	WEGMANN'S No. 3.	PROPOSED DAM.
Height.....	200 ft.	200 ft.
Crest.....	18.74 ft.	20 "
Specific gravity of masonry.....	2.33	2.33
Volume per foot of length.....	15195.1 cu. ft.	14222.2 cu. ft.
Maximum pressure, reservoir full.....	8.13 tons.	8.12 tons.
" " " empty.....	10.33 "	13.92 "
Coefficient of friction necessary.....	0.56	0.60
Coefficient against overturning.....	3.20	3.40

This comparison is not made in order to criticize Mr. Wegmann more than other analysts, but because his figures are reached after a digest of those of most previous writers, and show points of betterment over them. As before stated, the criticism is aimed at the assumption that, because a uniform constriction to a safe profile insures a safe structure, uniformity is either necessary or economical.

The quantity of masonry in this proposed type is always less than in uniform-profile types.

The maximum intensity of pressure when the reservoir is full is more for low dams, less for high dams, but never reaches the high pressures of Mr. Wegmann's No. 3.

The maximum intensity of pressure when the reservoir is empty, up to 150 ft. in height, is less. Above that height, it is more. The vertical line from the center of gravity falls always above the middle third. The writer has never been able to see the reason for requiring it to fall inside the middle third. It does not fall dangerously near the upper toe. A foundation so yielding, or a construction so flimsy, that a wall, braced on one side with substantial buttresses, which would fail when not subjected to side pressure, is hardly to be considered in the catalogue of dam possibilities.

The factor of safety against overturning is greater in the proposed type.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PAPERS AND DISCUSSIONS.

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IMPROVEMENT OF THE BLACK WARRIOR,
WARRIOR AND TOMBIGBEE RIVERS,
IN ALABAMA.

By R. C. McCALLA, M. Am. Soc. C. E.

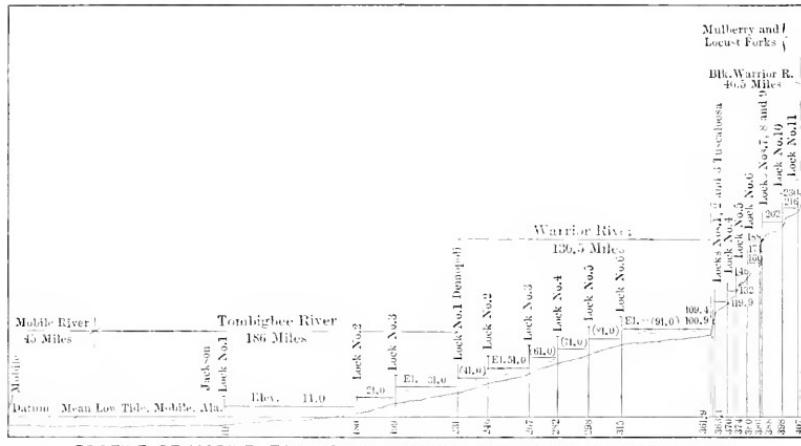
TO BE PRESENTED SEPTEMBER 3D, 1902.

GENERAL CHARACTERISTICS.

The Black Warrior, Warrior, and Tombigbee Rivers, together with the Mobile River, form a chain of rivers flowing through the center of the great Warrior Coal Basin, and entering the Gulf of Mexico through Mobile Bay. The Black Warrior River is formed by the junction of the Mulberry and Locust Forks. At Tuscaloosa the name changes to Warrior. The Warrior flows into the Tombigbee about one mile above Demopolis, and the Tombigbee and Alabama Rivers join and form the Mobile River about 45 miles above the City of Mobile. Fig. 1 is a profile of these rivers, with the elevations of the locks. Fig. 2, a map of Alabama, shows the location of the rivers. The total length of these streams from the junction of Mulberry and Loenst Forks to Mobile is 408 miles, and the total fall at low water is 214.5 ft., as shown in Table No. 1.

NOTE.—These papers are issued before the date set for presentation and discussion. Correspondence is invited from those who cannot be present at the meeting, and may be sent by mail to the Secretary. Discussion, either oral or written, will be published in a subsequent number of *Proceedings*, and, when finally closed, the papers with discussion in full will be published in *Transactions*.

Above Tuscaloosa the Black Warrior flows through a narrow gorge enclosed by steep hills and perpendicular rock bluffs. At low water there is a succession of level pools connected at frequent intervals by steep, shallow, rock rapids varying in fall from a few inches to 19 ft. The bed of the stream is generally of hard sandstone. Below Tuscaloosa these streams flow through alluvial valleys several miles wide, and are subject to overflow during floods. The bed is generally composed of thick layers of sand and gravel underlaid with clay or soft lime-stone. Occasional ledges of the latter rise nearly to the low-water surface, and form reefs across the river, but most of the shoals have beds of sand and gravel, and there is rarely more than 1 ft. fall through one shoal.



PROFILE OF MOBILE, TOMBIGEE, WARRIOR AND BLACK WARRIOR RIVERS.

FIG. 1.

The minimum discharge of the Black Warrior and Warrior Rivers is about 150 cu. ft. per second, and the maximum discharge about 150 000 cu. ft. per second. The minimum discharge of the Tombigbee River below Demopolis is about 400 cu. ft. per second, and the maximum discharge probably approaches 300 000 cu. ft. per second. Large floods usually occur during the winter and spring, and at rare intervals during the summer and fall. They carry vast quantities of drift wood, and sometimes cause considerable loss of property. Smaller rises, which interfere with construction, but do no other damage, usually occur several times during each low-water season, from June to December. The most rapid rate of rise ever recorded at Tusca-

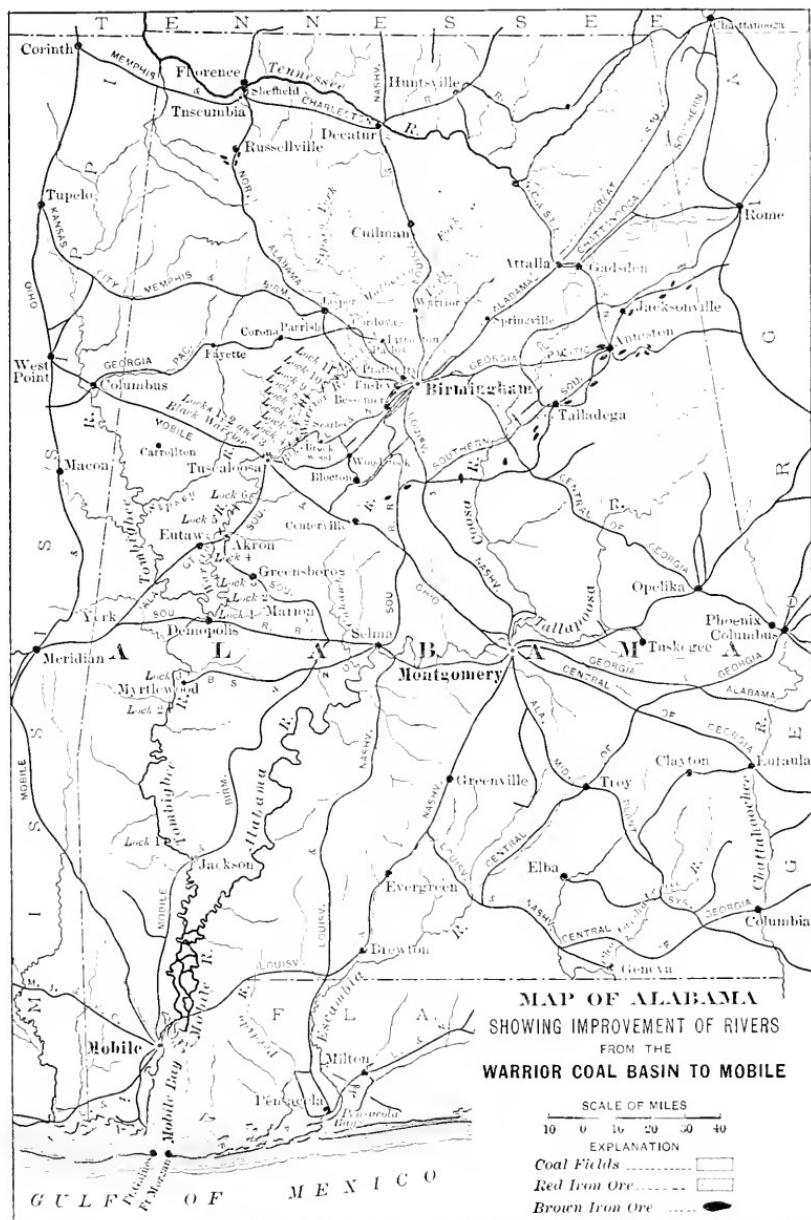


FIG. 2

loosa was 5 ft. per hour for 4 hours, after which the rate gradually decreased; but rises of 2 ft. per hour are not uncommon. The rate of rise is usually greatest at Tuscaloosa, and gradually decreases below that point. The maximum oscillation of the Black Warrior River varies from 15 to 50 ft. at different points. The maximum oscillation of the Warrior and Tombigbee Rivers is 67 ft. at Tuscaloosa; 47 ft. at Gray's Landing, 42 miles below Tuscaloosa; and 70 ft. at Demopolis, below which place it gradually decreases.

TABLE No. 1.

Description.	Length, in miles.	Fall, in feet.	Average low-water slope, in feet per mile.
Black Warrior River, Forks to Tuscaloosa.....	46.5	128.5	2.76
Warrior River, Tuscaloosa to Mouth of Warrior.....	130.5	58.5	0.45
Tombigbee River, Mouth of Warrior to Mouth of Tombigbee	186.0	27.5	0.15
Mobile River, Mouth of Tombigbee to City of Mobile.....	45.0	6.0	0.00
Totals and average.....	408.0	214.5	0.53

PREVIOUS TO IMPROVEMENT.

The Mobile River is tidal, and has ample depth for river navigation without improvement. Previous to improvement the Tombigbee River was navigable for light-draft steamboats to Demopolis about 9 months per annum, and the Warrior River to Tuscaloosa about 4 months per annum. Tuscaloosa was considered the head of navigation. Rafts and flatboats were brought down the Black Warrior on floods, but there was no other navigation on this stream.

EARLY IMPROVEMENT.

Prior to the beginning of work on the present project, in 1888, no work was done on the Black Warrior, and work on the Tombigbee and Warrior Rivers was confined to removing snags, cutting overhanging trees, dredging through shoals, and building light dikes and training-walls to confine the water to the channel. This work was of considerable benefit to navigation, but did not extend the boating season materially, or do away with the uncertainty of navigation during a part of each boating season.

PRESENT PROJECT.

The present project is to obtain a waterway for the transportation of coal, in barges of 6 ft. draft, from the Warrior coal fields to the Gulf of Mexico, by a slack-water system of locks and dams. There will be twenty locks and dams, with a total lift of 230 ft., the upper lock and dam raising the low-water surface about 15.5 ft. at the junction of Mulberry and Locust Forks. The total cost will approximate \$5 000 000. Beginning at the lower end, there will be: In the Tombigbee System, Lock No. 1 of 11 ft. lift and Locks Nos. 2 and 3, each of 10 ft. lift; in the Warrior System there will be Locks Nos. 1 to 6, each of 10 ft. lift; in the Black Warrior System there will be Lock No. 1 of 10 ft. lift, Lock No. 2 of 8½ ft. lift, Lock No. 3 of 10½ ft. lift, Lock No. 4 of 12 ft. lift, and Locks Nos. 5 to 11, each of 14 ft. lift. The elevations of these locks are shown on the profile, Fig. 1.

The locks are to have 52 ft. clear width, 286 ft. available length, 322 ft. length between hollow quoins, and minimum depths of 6½ ft. on the miter sills and 7 ft. in the lock chambers. Steel lock gates and fixed dams about on line with the upper gates are to be used throughout. The work is now in progress, and is being carried out by the United States Government under the continuing contract system of river and harbor appropriations.

WORK ACCOMPLISHED—TOMBIGBEE SYSTEM.

Lock No. 1 is located and partly built at McGrew's Shoal, 111 miles above Mobile, on a reef of soft limestone which extends across the river a few feet below low water. Work on this lock was begun in 1896, and suspended for lack of funds in 1899. The work was done with hired labor, and was greatly retarded at various times by leaks in the coffer-dam, freshets and lack of funds. The lock walls are finished, but the gates and valves are not completed, and no work has been done on the dam or abutment. The lock walls are of concrete, composed of 1 part loose cement, 2½ parts sand, and 6 parts pebbles. They are founded directly on the soft limestone, trenches in which were dug about 2 ft. deep under each wall and filled with concrete for a footing course. Lagerdorfer Portland cement was used throughout. The dam and abutment will also, probably, be built of concrete.

The river below Lock No. 1 is tidal, and needs no improvement except dredging in places. Locks Nos. 2 and 3, between Lock No. 1

and Demopolis, have not yet been located, and no appropriation has been made for their construction.

WORK ACCOMPLISHED—WARRIOR SYSTEM.

The surveys, borings and descriptions of lands needed for Locks Nos. 1, 2 and 3, have been completed, but no appropriation has yet been made for their construction. The general features of their design will follow closely those for Locks Nos. 4, 5 and 6 of the same system. The locks and abutments will be of Portland cement concrete on pile foundations. The dams will be timber cribs on pile foundations, similar to those at Locks Nos. 4, 5 and 6, of the Warrior System. Lock No. 1 is located in the Tombigbee River, just above Demopolis and just below the mouth of the Warrior, 230.6 miles above Mobile. Locks Nos. 2 and 3 are located in the Warrior River, 246.1 and 266.7 miles, respectively, above Mobile.

Locks Nos. 4, 5 and 6 are 282.2, 298.1 and 315.0 miles, respectively, above Mobile. These three locks are being built by contract, and are about half completed. They will probably be finished during 1902. The locks and abutments are being built on pile foundations, and will be of Portland cement concrete, 1 part cement, as packed in barrels, 3 parts sand, and 6 parts clean pebbles. The sand and pebbles are dredged from the river bed near the lock sites. The dams will be timber cribs with timber aprons, all founded on piles cut off about 1 ft. below low water.

Considerable dredging will be required to secure proper slack-water channel depths in the upper portions of all the pools of the Tombigbee and Warrior Systems.

WORK ACCOMPLISHED—BLACK WARRIOR SYSTEM.

The change of name of the river, from Black Warrior to Warrior, occurs at the Tuscaloosa wagon bridge, 361.5 miles above Mobile. Locks Nos. 1, 2 and 3 are 361.9, 362.3 and 363.1 miles, respectively, above Mobile, overcoming the Tuscaloosa Falls, a series of rock rapids having a total fall of 24.5 ft. in about 2 miles. The Tuscaloosa wagon bridge is built on the lowest reef of these rapids, and here extensive channel work, largely rock excavation, partly in the Warrior and partly in the Black Warrior, was carried out in order to secure the required

IMPROVEMENT WARRIOR RIVER ALA
PLAN AND PROBLEMS OF BOATING

PLAN AND PROFILES OF BORINGS

AT PROPOSED SITE
OF LOCK AND DAM NO. 3

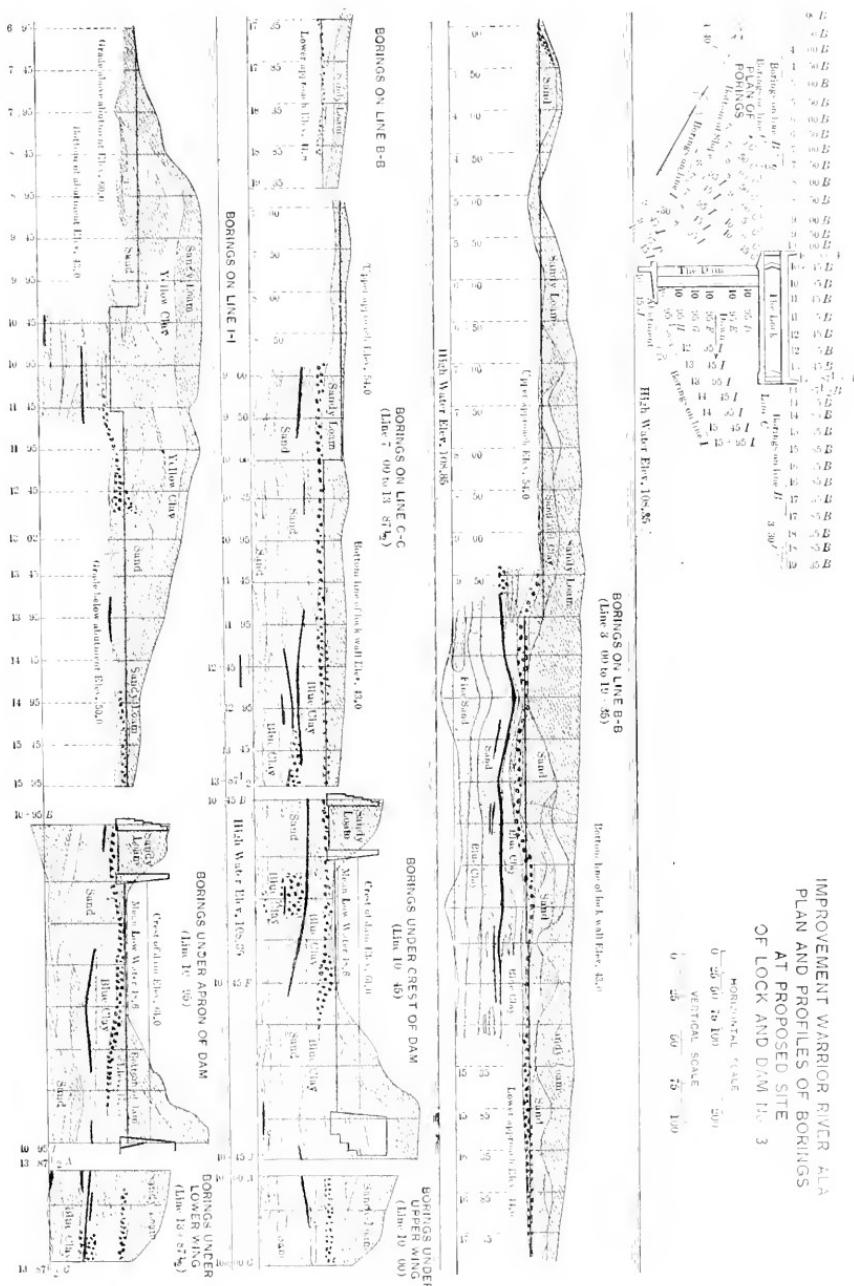


FIG. 23

depth below pool level in the lower approach to Lock No. 1, which is built on the next reef above. Considerable rock excavation was also required in the lower approach to Lock No. 3.

All three locks and dams were built with hired labor. They were begun in 1888, and completed and opened for traffic in 1895.

Lock No. 4 is 370.1 miles above Mobile, and is being built by contract. It is about half completed, and should be finished during 1902, Locks Nos. 5 to 11, inclusive, between Lock No. 4 and the junction of Mulberry and Locust Forks, have not yet been located, and no appropriation has been made for their construction.

ENGINEERING FEATURES—WARRIOR SYSTEM.

Location.—Trial borings were made at every practicable site for each lock, within limits of several miles, as fixed by the profile of the river, and, at the site finally selected, borings were taken 50 ft. apart under all structures and through the approaches. Borings were made by the water-jet method, 1-in. water pipe and 2-in. casing being used. The borings usually penetrated not less than 30 ft. below the lock floor. For Locks Nos. 1, 2 and 3, 322 borings were made, aggregating 13 716 ft. in depth, at a cost of \$3 861, or about 28 cents per linear foot. The results of the borings were shown on drawings and exhibited to bidders (see Fig. 3). The site of Lock No. 5, looking up stream, is shown on Plate XVIII, Fig. 1; Lock No. 6, with the forms for the concrete walls, is shown on Plate XVIII, Fig. 2.

At first, efforts were directed toward finding suitable rock reefs on which to build, but it was soon discovered from the borings that such reefs did not exist, the rock found being in fragments or in thin ledges, and generally quite soft and unsafe for foundations. Efforts were then made to find locations where pile foundations could be driven with the minimum difficulty, rock being avoided. Limits for the location of each lock were fixed so that the lower miter sill with a given elevation would be from $2\frac{1}{2}$ to 5 ft. below mean low water. Locations were sought in wide, shallow places with good, high banks and in curved instead of straight reaches. The locks are always located on the convex shore, in order to secure better protection from drift during floods, and on straight approaches parallel to the axis of the lock re-entering the stream.

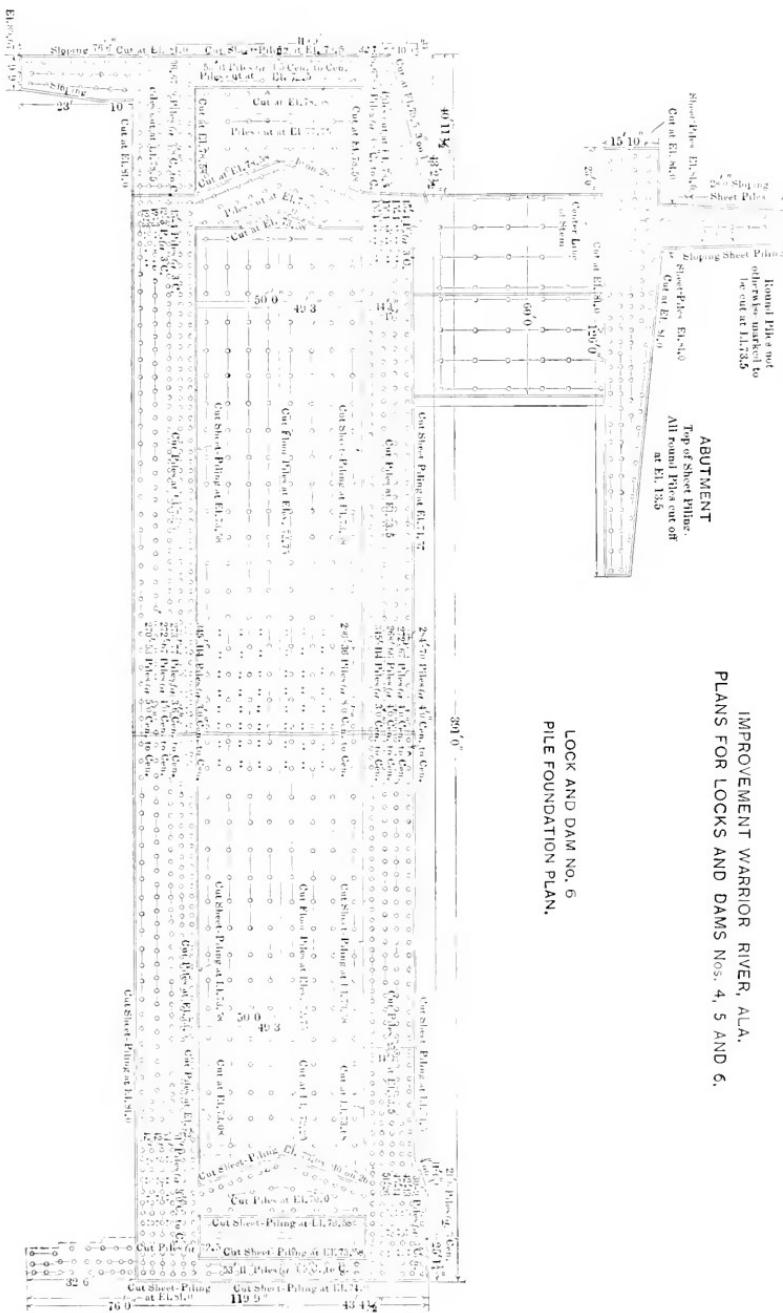
Fixed or Movable Dams.—After very careful consideration of the

**IMPROVEMENT WARRIOR RIVER, ALA.
PLANS FOR LOCKS AND DAMS Nos. 4, 5 AND 6**

ABUTMENT Top of Sheet Piling. All round Pilings cut off

Konrad Miller not otherwise marked to be cut at 1.1, 3.5

345



question of fixed or movable dams, the former were adopted, for several reasons. Owing to the long low-water period of about 8 months annually, and the frequent occurrence during the other 4 months of stages which would drown the fixed dams, movable dams would add only about 3 months annually to the period of open-river navigation. Owing to the small size of the stream, tows will always be small, and probably will not require more than one or two lockages in passing a lock. Therefore, delays from lockages will be less than on large streams where large tows are difficult to maneuver and require more lockages to pass a lock. The low-water flow of the river, at times for several months, is only 150 to 300 cu. ft. per second, and, therefore, the dams must be as tight as practicable in order to maintain the pool level at the crest of the dam. Most types of movable dams are not tight enough to keep the pools full under such conditions. The cost of construction, operation and maintenance is much greater with movable than with fixed dams; and, owing to the enormous quantities of heavy drift carried by floods, the cost of operating and maintaining movable dams on this river would probably be greater than usual. The stream when improved will serve more as a canal than as a river, and is treated accordingly.*

Lift, Guard, Etc.—The lift of each lock was fixed at 10 ft., the guard at 13 ft., and the minimum length of the dam at 300 ft. These dimensions are based largely on experience under similar conditions at Lock No. 1 of the Black Warrior System; and it is believed that they will afford practically uninterrupted navigation, the dams being drowned on a rising river by the time the lock walls are submerged. Higher lifts were not adopted because it was feared they might raise the flood heights and thereby damage lands and other property in the valley.

Mounds.—The average width of the river at low water is about 200 ft.; therefore the length of dam adopted throws the locks and abutments well back into the banks, and causes heavy excavation, both for these structures and for the lock approaches at each site. It was not considered advisable to waste this material in the river, and therefore what is not needed for back-filling is used for building large mounds,

* Usually one of the chief advantages of movable dams is that they reduce the height and duration of floods. In this case floods overflow the entire valley to an average depth of 5 to 10 ft. for several miles in width. It is probable, therefore, that fixed dams of 10 ft. height and 300 ft. length in the low-water channel will have little, if any, influence on the height and duration of floods.

IMPROVEMENT WARRIOR RIVER, ALA.
PLANS FOR LOCKS AND DAMS Nos. 4, 5 AND 6.

LOCK NO. 0.

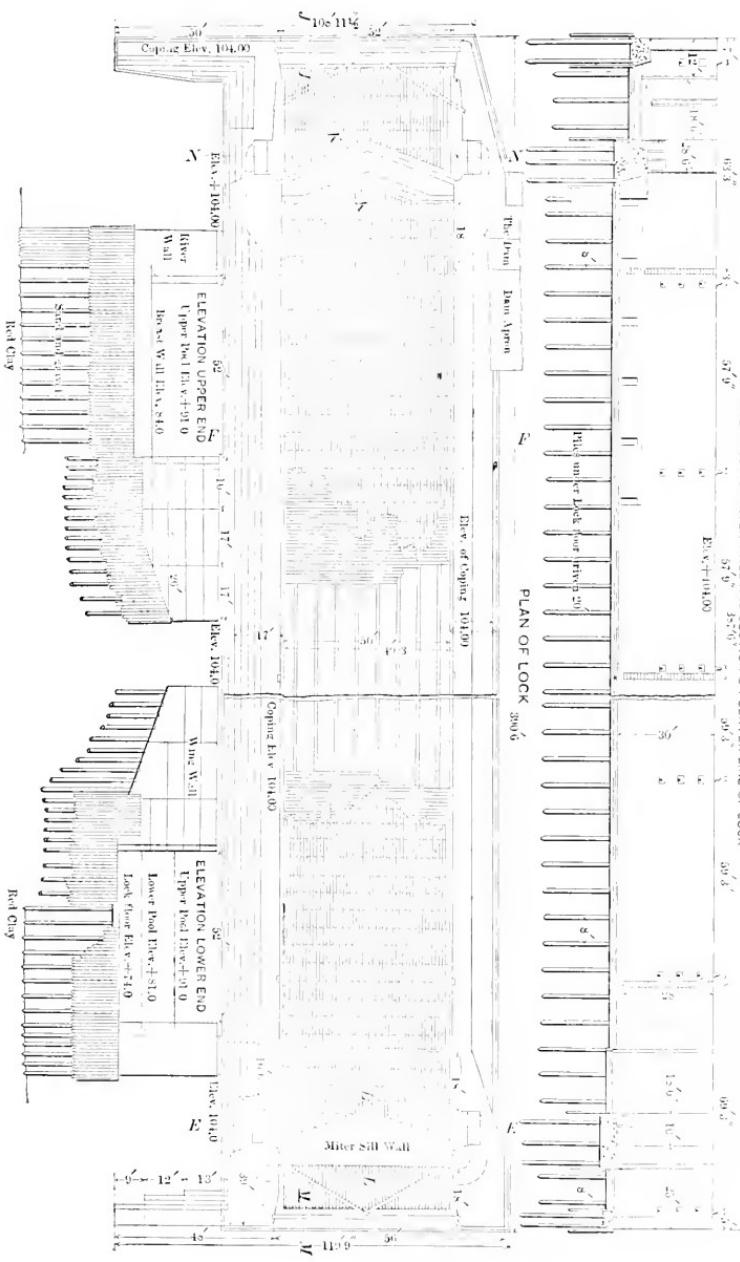


FIG. 5.

5 ft. above high water, in rear of the locks and abutments. These mounds will be quite useful as places for storing property, etc., as the entire reservations, except at one lock site, are subject to overflow. The lock houses will be built on the mound back of the lock.

Plans.—Detailed drawings of Lock and Dam No. 6 are shown in Figs. 4 to 17.

Concrete.—The concrete is mixed in a 4-ft. cubical mixer making eighteen revolutions in two minutes, and the usual charge is 1 bbl. of packed cement, 3 bbls. of sand, and 6 bbls. of pebbles, which make about 29 cu. ft. of concrete rammed in place. In all, 17 688 cu. yds. of concrete and mortar facing, containing 16 973 bbls. of cement, were placed during 1901, giving an average of 1.042 cu. yds. per barrel. The sand and pebbles are quite clean, the former being coarse and sharp, and the latter about $\frac{1}{4}$ in. to 1 in. in diameter, and both showing only 33 to 34% of voids. Mortar facing, $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. thick, composed of 1 part packed cement and 3 parts sand, is used on all exposed faces of the walls. The walls are built in blocks about 20 ft. long and of the full thickness of the walls. The blocks are separated by continuous vertical joints from bottom to top to provide for contraction, and the joints are indicated by V-shaped grooves in the faces of the walls. Alternate blocks are built first between bulkheads, two blocks being built usually at the same time. The intermediate blocks are built after the bulkheads are removed. The concrete is well rammed in layers about 6 ins. thick after ramming, and is usually wet enough to quake moderately when well rammed. Horizontal joints are left where the work stops at night, and are covered with $\frac{1}{2}$ in. of mortar before fresh concrete is deposited next day. After the forms are taken down, rough places in the exterior finish are chiseled smooth, and, to improve the finish of the walls, several coats of a thin wash of 2 parts cement and 1 part sand are applied.

Stability of the Walls.—The lock walls are 30 ft. in height above the floor, and are built on footing courses 2 ft. wider than the bases of the walls. The faces next to the lock chamber are vertical. The bank wall is designed as a retaining wall, and its average thickness, not including the footing course, is about 37% of its height. The back is stepped so that a part of the back-filling adds to the stability of the wall against overturning. In designing the river wall it was assumed that 17 ft. is the maximum head that will come against it, this being

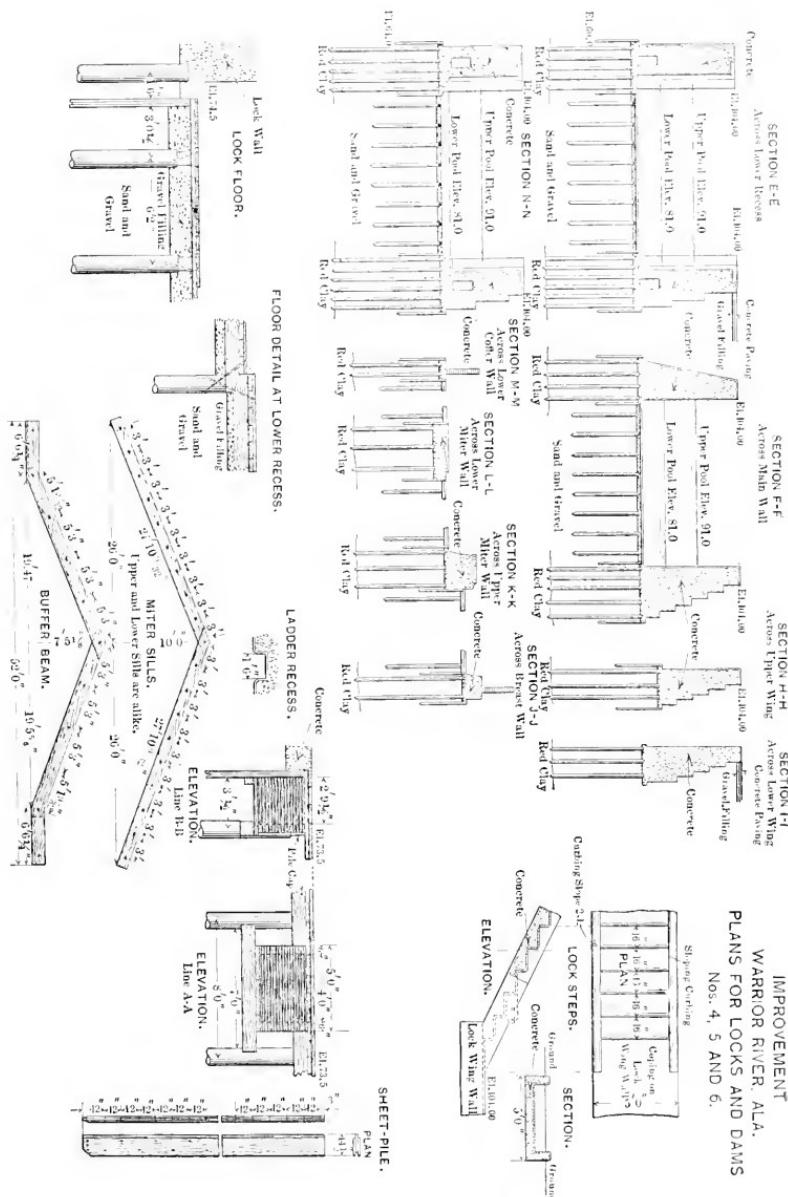


FIG. 6

with the lower pool 10 ft. above low water and the lock chamber pumped out. The intention is never to place the coffer timbers above this height, so that should the water rise higher it will pass over the coffer timbers and relieve the head by flooding the lock chamber. Under this head the river wall has a factor of safety of 6 against overturning. With a head of 24 ft. against the river wall the factor of safety is 1.8, and with a head of 30 ft. the river wall would overturn. None of the walls can slide, owing to the nature of the pile foundations.

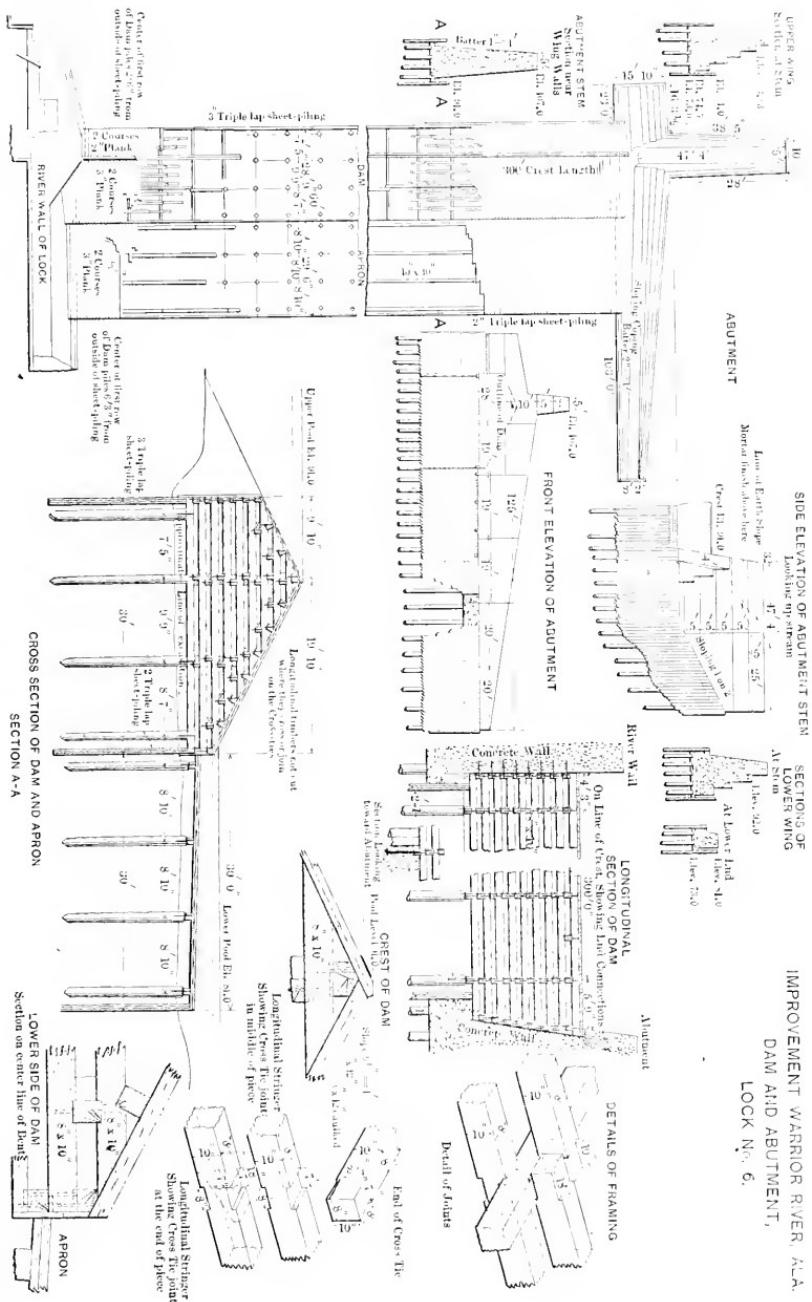
The buttresses are located so that the line of thrust of the gates will pass diagonally through them, but they are made thicker than necessary to take up this thrust, in order to give room for the gate maneuvering gearing on top.

The abutment stem is a core-wall running back into the bank, with embankments on both sides. These embankments are held in place by the abutment wings, which have a face batter of 2 ins. per foot, and are designed as surcharged retaining walls. Their average thickness is about 40% of their height. The abutment also has a footing course 2 ft. wider than the bases of the walls. This is not included in computing the average thickness of the walls, and is supported by the dam and a minimum depth of $6\frac{1}{2}$ ft. of water above the footing course in the lower pool.

Pile Foundations.—Both foundation piles and sheet-piles were forced into the sand and gravel under the sites with a combination of hammer and water-jet, practically to refusal, care being taken as the penetration decreased to lessen the blow so as not to injure the pile. While the hammer was of great assistance, the jet proved to be the main dependence in getting the piles down, and they could not have been driven without it.

Every wall is entirely surrounded by an inner and outer row of Wakefield sheet-piling. The object of this is both to confine the material under the walls so that it will assist the foundation piles in sustaining their load, and to reduce the percolation of water under the walls due to difference in head. The outer row of sheet-piling also serves as part of a coffer-dam during construction.

The round foundation piles are driven 3 to 4 ft. between centers in the space between the two walls of sheet-piling. They are cut off 6 to 12 ins. above the bottom of the concrete, which is rammed around



and over them. They are so close together that grillage was considered entirely unnecessary and probably detrimental to the work. The concrete, therefore, rests directly on the pile heads, from which the bark is removed. The maximum loading on the foundation piles is about 20 tons each.

The average penetration of the sheet-piles is about 12 ft., and of the round piles about 18 ft., below the bottom of the masonry. So far, not the slightest evidence of settlement has been detected. See Fig. 4.

Lock Floors.—As the floor might at times be subjected to an up-thrust, due to 17 ft. head, a tight concrete floor, safe against this up-thrust, would have to be very massive and costly. It was decided, therefore, to use a timber floor, tight against downward leakage, to avoid loss during lockages, and open for upward leakage, to avoid up-thrust. Floor piles are driven in parallel rows and capped longitudinally with 10 x 10-in. timbers. The foundation is then covered with 15 ins. of pebbles flush with the tops of the caps and intended to permit the water to circulate freely under the floor. The caps and pebbles are then covered with a cross-layer of 3-in. plank caulked with oakum, and this with a longitudinal layer of 2-in. plank, to keep the oakum in place and protect it from culvert scour. This floor is designed for a maximum downward pressure due to 10 ft. head without aid from the pebble filling between the caps. The maximum head occurs at low water with the lock chamber filled.

The floor is relieved from up-thrust by 2-in. auger holes spaced about 10 ft. apart. This design is based on the supposition that when the lock is pumped out for repairs water under the maximum head of 17 ft. will percolate slowly under the sheet-piling and through the mass of sand and gravel under the lock. On reaching the pebble filling it will circulate more freely, pass up through the auger holes, and flow to the drainage pumps. It is believed that water due to percolation will thus be kept in motion, and cannot exert dangerous up-thrust. Downward leakage through the auger holes when the lock chamber is filled is prevented by ball-valves. See Fig. 5. The details of the valve are shown in Fig. 8.

Drain Tile.—Single lines of 8-in. drain tile, on a grade of 6 ins. per 100 ft., and emptying into the lower pool below the pool level, are laid behind the lock bank wall and the lower wing of the abut-

IMPROVEMENT WARRIOR RIVER, ALA.
PLANS FOR LOCKS AND DAMS Nos. 4, 5 AND 6.

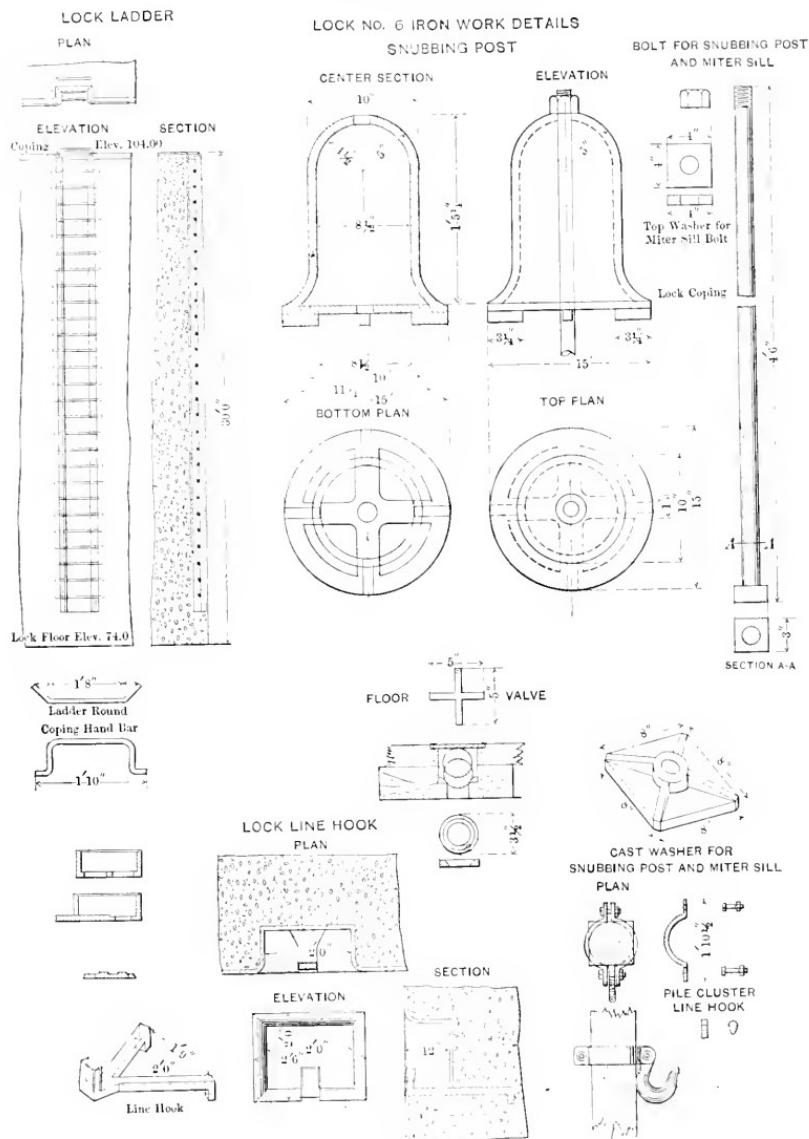


FIG. 8.

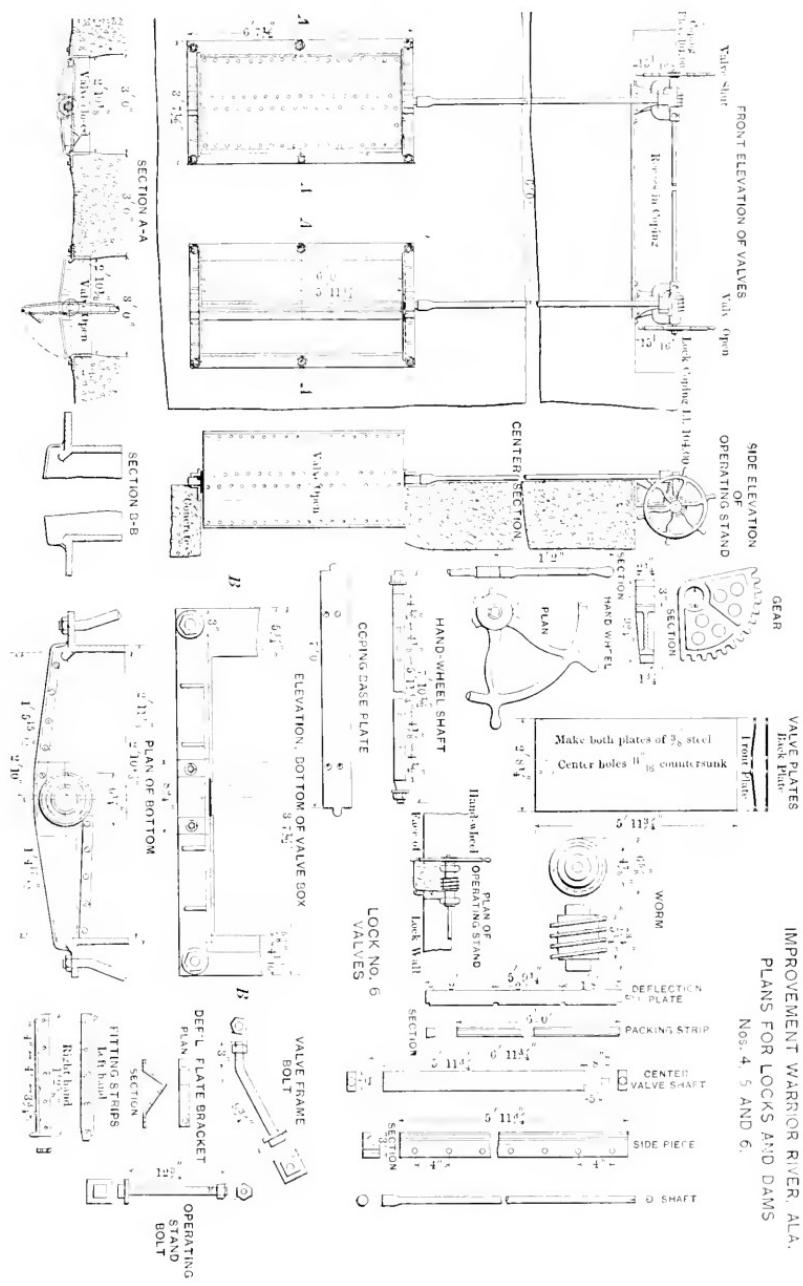
ment to drain the back-filling. Vitrified tiling is used, laid with open joints and surrounded with pebbles to serve as a screen. See Fig. 10.

Dams.—Concrete dams on pile foundations were first contemplated; but this plan was abandoned because it involved a necessity for coffer-dams, difficulty in disposing of the flow of the river during construction, and the possible danger of wash-outs underneath, which would be very difficult to repair.

The plan adopted is a bottomless timber crib, resting on piles and filled with "one man" stones, the interstices in which are filled with sand and gravel washed in to reduce voids and add to the weight, but no cement is used. The crib is sheathed with plank, which is caulked to reduce leakage, and the filling rests directly on the bed of the river. The base of the dam is 30 ft. wide, and has a row of Wakefield sheet-piling under each face, to reduce percolation under the dam and prevent the escape of the filling. The crest of the dam slopes both ways to an apex 10 ft. from the up-stream face. Below the dam and under the pool level is a timber apron, 6 ins. thick and 30 ft. wide, resting on piles, and terminating with a row of Wakefield sheet-piling under the down-stream edge, to hold the filling under the apron and guard against undermining below. Should scour take place below this apron, it is proposed to dump in big stones until erosion ceases.

It is believed that this dam can be built during low water without coffer-damming, one course being placed and filled at a time, the river running over in a sheet, and the work being protected locally with flash-boards. It is also believed that, should a wash-out start under the dam, the filling will drop into and choke the cavity while small. Then the sheathing can be removed and the filling replaced in the top of the dam, which can be examined at low water by sounding through augur holes, which can be bored and afterward plugged. See Fig. 7.

Gates.—The gates are built of soft steel of 54 000 to 64 000 lbs. ultimate strength per square inch, and designed for a fiber stress of 10 000 lbs. per square inch. They are of the mitering horizontal-girder type, with single skin, and largely follow the designs of the Deep Waterways Commission. The girders have straight down-stream flanges, in order to simplify construction, and curved up-



Ergonomics

stream flanges, in order to distribute the metal to advantage. The bottom girder bears against the miter-sill cushion, which is also straight on the bearing surface. The skin plates are $\frac{3}{8}$ in. thick, this being the minimum thickness of metal used in the gates owing to possible weakening from rust. The girders are fastened to the miter and heel posts with connecting angles. A wooden footway is bolted to the top of the gates.

The miter posts are of oak, backed with built-up steel channels to stiffen them. Wood is used for the miter-post cushions because they can be trimmed after the gates are erected, so as to properly adjust

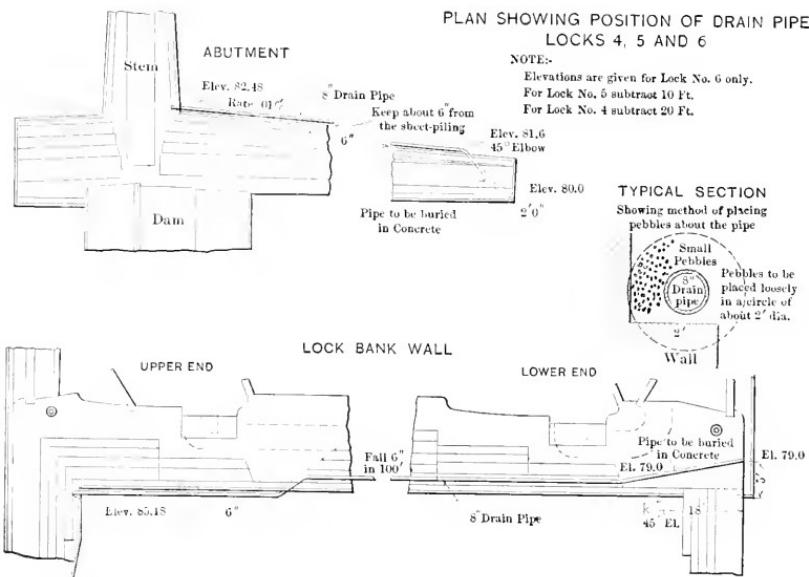


FIG. 10.

the length of the gates and at the same time secure a perfect fit between the two posts. Also, these cushions can be easily renewed. The heel posts, owing to the difficulty of renewing wooden ones, are made of cast iron, in sections about 10 ft. long, joined with internal flanges having male and female bolted connections. Vertical dovetailed grooves are cast along the bearing surfaces of the post, and are used to hold in place strips of lead packing, which are trimmed and adjusted to make a water-tight joint with the hollow quoin. In order to avoid the wear of this packing, the heel post is hung eccentrically

SECTION E-E

IMPROVEMENT WARRIOR RIVER.

A. A.

UPPER GATES FOR LOCKS Nos. 4, 5 AND 6.

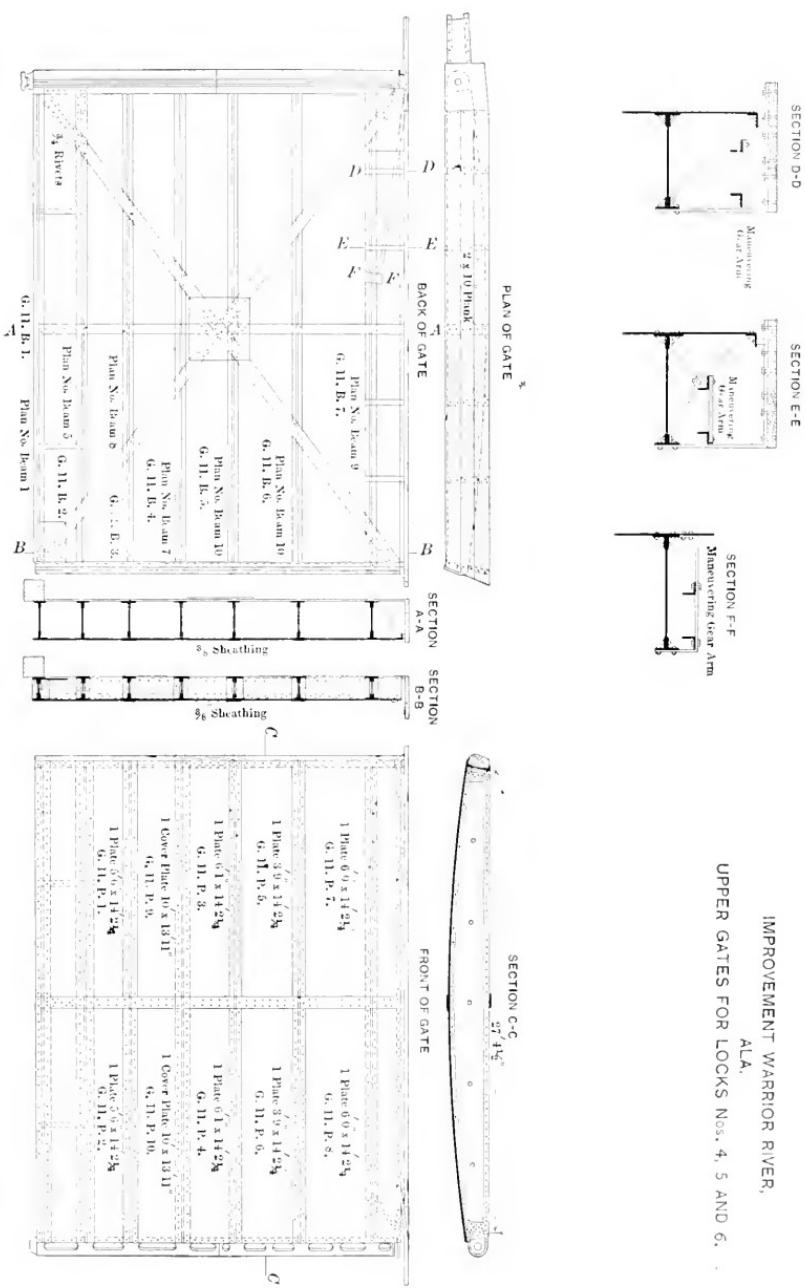


FIG. 11.

$\frac{1}{2}$ in., and plays off from the quoin when the gate begins to open. The quoins are cast iron, and planed true on the rubbing and bearing surfaces. The bottom of the heel post is fitted with a cast-iron socket which rests on a cast-iron pivot bolted to the masonry footing course. The bearing surfaces of the socket and pivot are chilled. The top gudgeon is a 4-in. steel pin supported by two steel plates, between which the gate yoke works. The yoke is attached to the anchorages with a gib and key which permit adjustment and also permit the removal of the yoke with ease. The yoke, etc., fits in a covered cast-iron box below the coping, where it is out of the way and yet is easily accessible for adjustment. The anchorages, which slope downward and are provided with anchor plates at the lower ends, are built into place with the concrete walls.

A stiff, built-up, operating lever is bolted to the top of the gate, and projects backward, swinging just above the coping. A small trolley travels in a slot at the outer end of the lever, and to this is attached an endless sprocket chain which passes around two idlers and a driving wheel. The latter is operated by a hand-lever and crab, the lock hand walking around the crab and pushing the lever in one direction to open the gate and reversing the motion to close it. This hand-lever is unshipped during floods, and the remainder of the gearing, being quite close to the coping and made as flat as practicable, offers little obstruction to floating drift. This maneuvering gear is quite simple and effective. It does not easily get out of order, is quite durable, and probably compares favorably with any other method of operating lock gates by hand. See Figs. 11 and 13.

Valves.—The valves are balanced gates with vertical axes, and are built of soft steel of 54 000 to 64 000 lbs. ultimate strength. There is a steel center shaft, 3 x 7 ins., with $2\frac{3}{4}$ -in. journals and two side bars of cast iron holding rubber packing strips in dovetailed grooves. The center shaft has a bottom adjustable step-bearing to reduce friction. The center shaft and side pieces are covered with two steel plates, $\frac{3}{8}$ in. thick, riveted through. The flat shaft is used to reduce the thickness of the valves, and the rivet heads are countersunk, the object being to have the open valve obstruct the flow into the culvert as little as practicable. The valve frame is a casting in one piece, built into the masonry and surrounding the valve. A steel rod, with a socket on its bottom end fitting over the square top of the valve shaft,

IMPROVEMENT WARRIOR RIVER, ALA. LOWER GATES FOR LOCKS Nos. 4, 5 AND 6

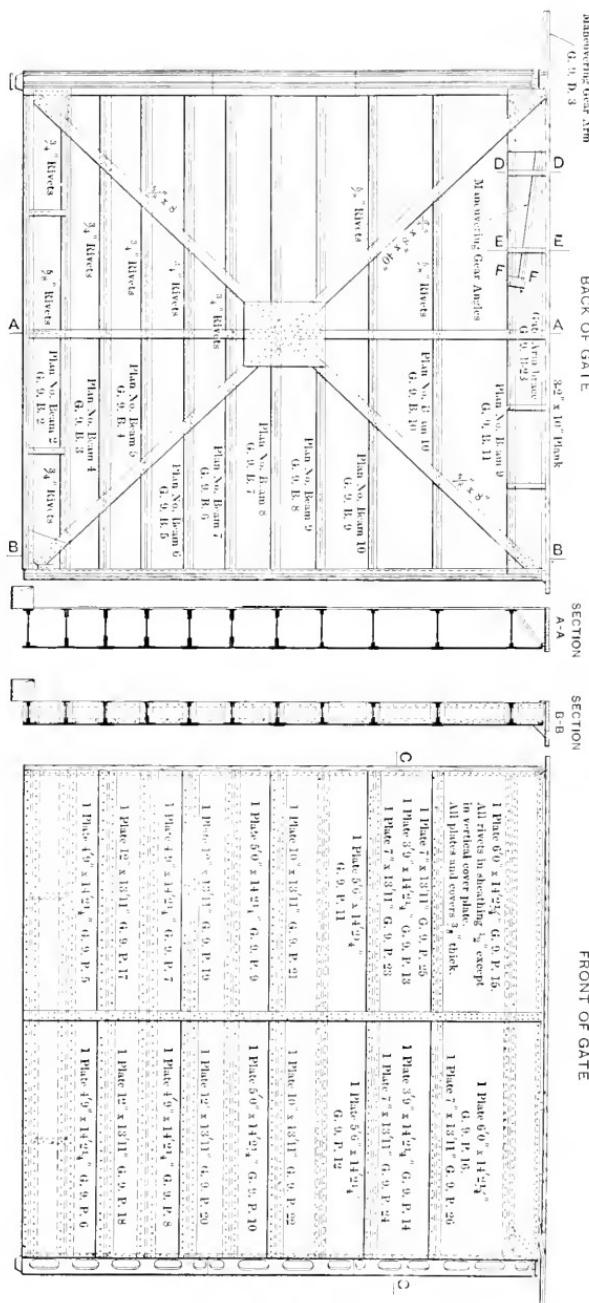


FIG. 12

extends up the face of the wall to the maneuvering gear, which is placed in a recess 15 ins. below the coping in order to protect it from drift. To the top of this rod is keyed a sector worm-gear which meshes into a worm on a horizontal shaft parallel to the axis of the lock. The valves are operated in pairs from the worm shaft, which has, between the two worms, a flanged coupling which admits of adjustment so as to close the two valves exactly together. The worm shaft is operated by hand-wheels at either end, which are removed during floods, on account of drift. The remainder of the operating machinery is below or about level with the coping, and, therefore, is protected from drift.

The worm gear is used for operating the valves because it gives ample power under all conditions, and, while it acts quickly enough, it does not permit of very rapid movement of the valves, and thereby protects them from water hammer when it is necessary to close them against a head of water. Steel valves are also preferred to cast valves, because they stand shock from water hammer with much more safety than cast valves.

A steel deflection plate is fastened to the inside of the valve on the half that swings outward into the lock chamber. As soon as the valve begins to open, the reaction of the water against this plate helps to swing the valve. The plate is located so that it does not reduce the area of the waterway when the valve is fully opened. Owing to the proximity of the valves to the gates, it has been found important to have the up-stream half of the valve swing outward into the lock chamber. This gives the water a more direct flow into the culvert while the valve is swinging than if the down-stream half swung outward, and, therefore, the valve swings more easily and smoothly. The main objects sought in designing this valve were simplicity and durability, and it has proved to be quite satisfactory in practice (see Fig. 9).

Culverts.—The culverts pass through the lock walls, around the gates at each end of lock. This avoids valves in the gates, which would tend to weaken the gates and complicate their construction. It also results in much simpler and cheaper construction than putting the culverts under the lock floor. The upper culverts extend about one-third the length of the lock chamber, and have from each culvert six different outlets into the lock chamber at intervals of 18 ft., from center to center, in order to distribute the flow and avoid objection-

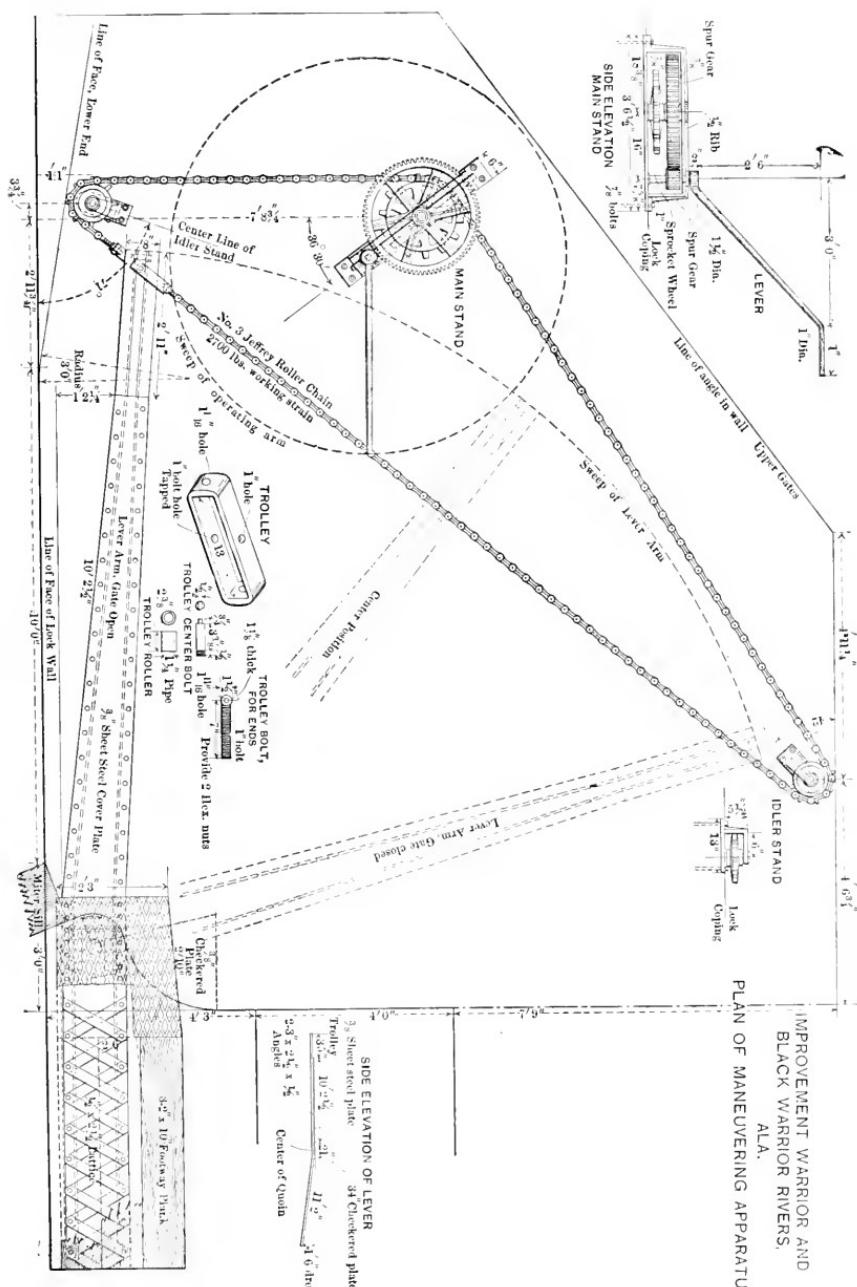


FIG. 13

able agitation in the lock chamber. The lower culverts each have a single outlet directed so as to wash away flood deposits in the lower bay.

There are four valves at each end, giving, combined, a clear opening of 58.17 sq. ft. for filling or emptying. The two culverts at each end have a combined area of cross-section of 60 sq. ft. These dimensions, with 10 ft. lift, give an estimated time of 6.3 minutes, using c equal 0.6, for filling or emptying the lock chamber (see Figs. 14 and 15).

Coffer Timbers.—These are to be used when it is necessary to pump out for repairs, there being no guard gates provided. The timbers will be each 12 x 18 ins. x 56 ft., and will be lowered with a derrick-boat into the coffer grooves near the extreme ends of the walls, being thus built up into walls of timber 10 ft. above the lower pool and 6 ft. above the upper pool level. Triangular center posts, each having two steel channels placed so as to receive the ends of the brace timbers, will then be placed upright against the middle of the coffer timbers, and 12 x 6-in. braces will then be lowered into the center-post channels at one end and into the brace grooves at the other end. The lock chamber will then be ready for pumping out, sawdust, or cinders, or canvas being used for reducing leakage between the coffer timbers. Should the pools rise above the coffer timbers, the lock chamber will be flooded and the pressure against the river wall relieved (see Figs. 14 and 15).

Bank Protection.—The horizontal space between the bank-wall wings and the slope immediately back of these wings will be paved with concrete blocks, 6 ins. thick and about 3 ft. square, built in place on a bed of sand and gravel 6 ins. thick. The approach slopes to the lock and abutment, for the full length of the lower approaches and for 100 to 150 ft. above the dam, will be protected with hand-placed rip-rap, 12 ins. thick, of hard, durable stone. It is expected that this rip-rap will slip in spots while floods are receding, and will have to be repaired from time to time until it becomes covered with a thick growth of willows and other vegetation.

Pile Clusters.—Heart piles will be driven in clusters above and below the locks to guide vessels in entering. Each cluster will contain eight piles, seven cut off level with the coping of the lock, and a center pile projecting 18 ins. above and rounded for a snubbing post. The center piles in certain clusters will also be equipped with line

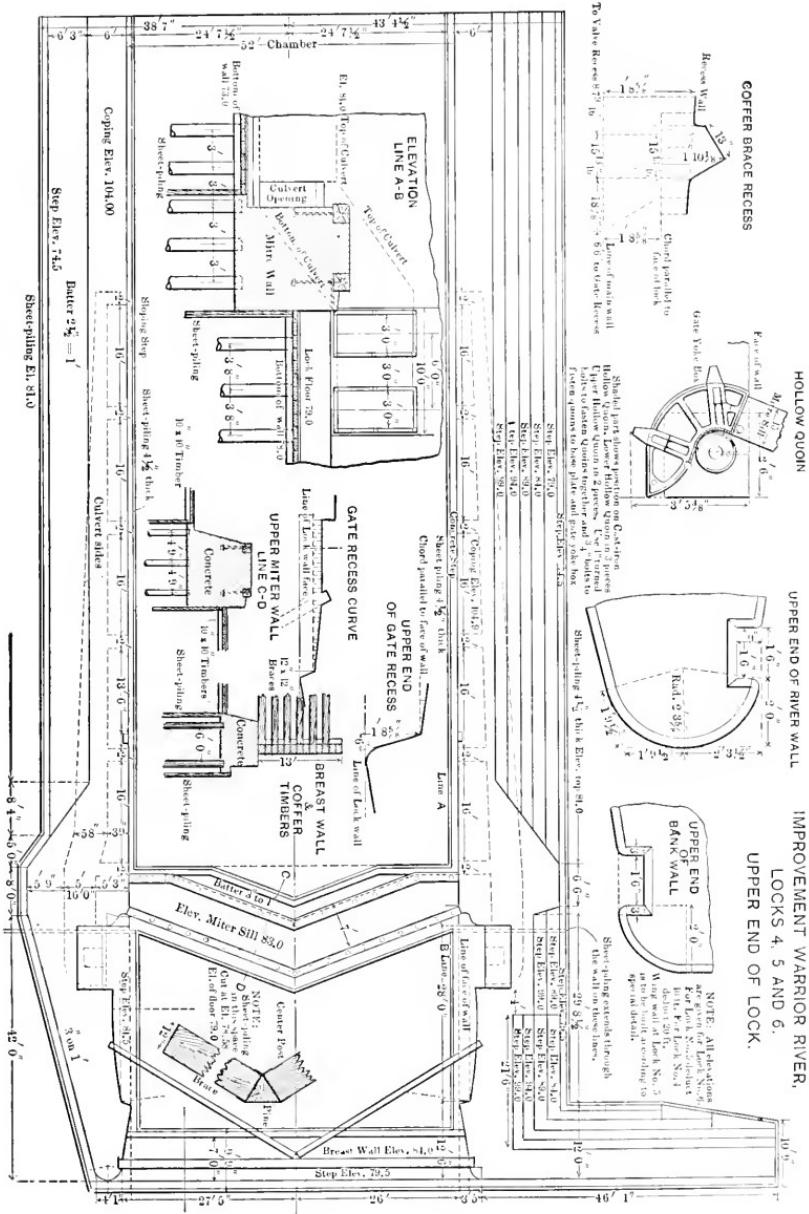


FIG. 14.

hooks for use at varying stages of water. That part of the piles above low water will be all heart, squared, 12 x 12 ins., with rounded corners. Below low water the piles will be left round. There will be six clusters above the lock, the first four being in line with the river wall and spaced 30 ft. between centers. The other two clusters flare from this line 10°, and are spaced 90 ft. between centers. The greater spacing of these two clusters is to facilitate the passage of drift. The other clusters are spaced closer, because the suck of the dam is greater near the lock. There will be four clusters below the lock in line with the bank wall, the first cluster 30 ft. from the end of lock wall and the others spaced 60 ft. from center to center. These clusters will keep vessels in proper position for entering the lock, and barges can be tied to them when fleets are locked in sections (see Fig. 16).

ENGINEERING FEATURES—BLACK WARRIOR SYSTEM.

Plans.—Sections and plans of Dams Nos. 1, 2 and 3, and detailed drawings of Lock and Dam No. 4, are shown in Figs. 17 to 20. The site of Lock No. 4, looking down stream, is shown on Plate XIX, Fig. 1; the lower end of Lock No. 1, and Dam No. 1, are shown on Plate XIX, Fig. 2.

Lift, Guard, Etc.—The lift at Lock No. 1 will be 10 ft. when the next dam below is built. The guard is 13 ft. and the length of the dam 339 ft. The lift of Lock No. 2 is 8.5 ft., the guard is 15.5 ft., and the length of the dam 409 ft. The lift at Lock No. 3 is 10.5 ft., the guard is 15 ft., and the length of the dam 650 ft. Generally, these dams are navigable when the lock walls are submerged. In 1897, during one of the most rapid rises which has occurred since the dams were built, the fall over the dams, just as the lock walls became submerged, was observed as follows: Dam No. 1, 1.14 ft. fall, river rising 2 ft. per hour; Dam No. 2, 2.10 ft. fall, river rising 2 ft. per hour; and Dam No. 3, 1.40 ft. fall, river rising 1 ft. per hour. In each case the dams became navigable in a few hours after the locks were submerged. While this same rise was subsiding, just as the lock walls emerged, the fall over Dams Nos. 1, 2 and 3 was 0.10 ft., 0.15 ft., and 0.20 ft., respectively.

The lift at Lock No. 4 will be 12 ft., the guard 12 ft., and the length of the dam 640 ft. Owing to the character and steepness of the stream here and above, it was not considered practicable to make the dams

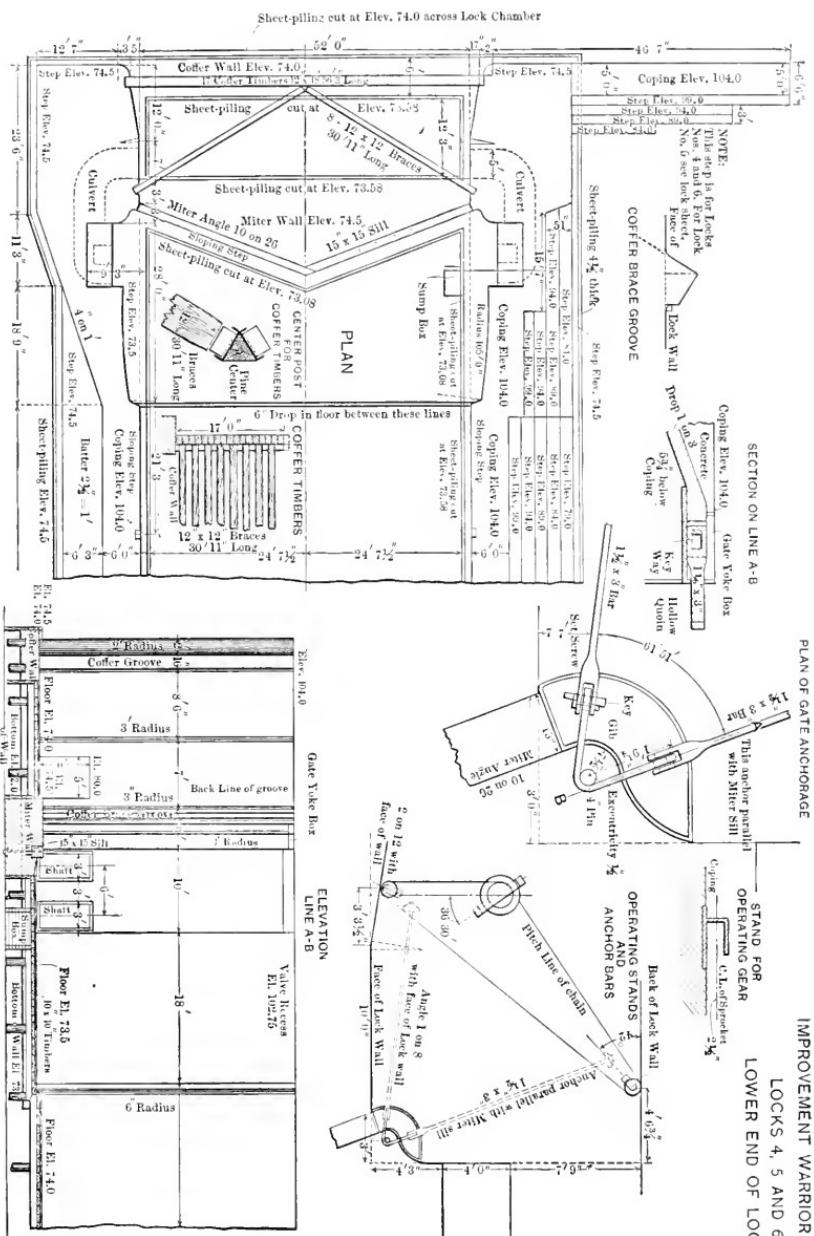


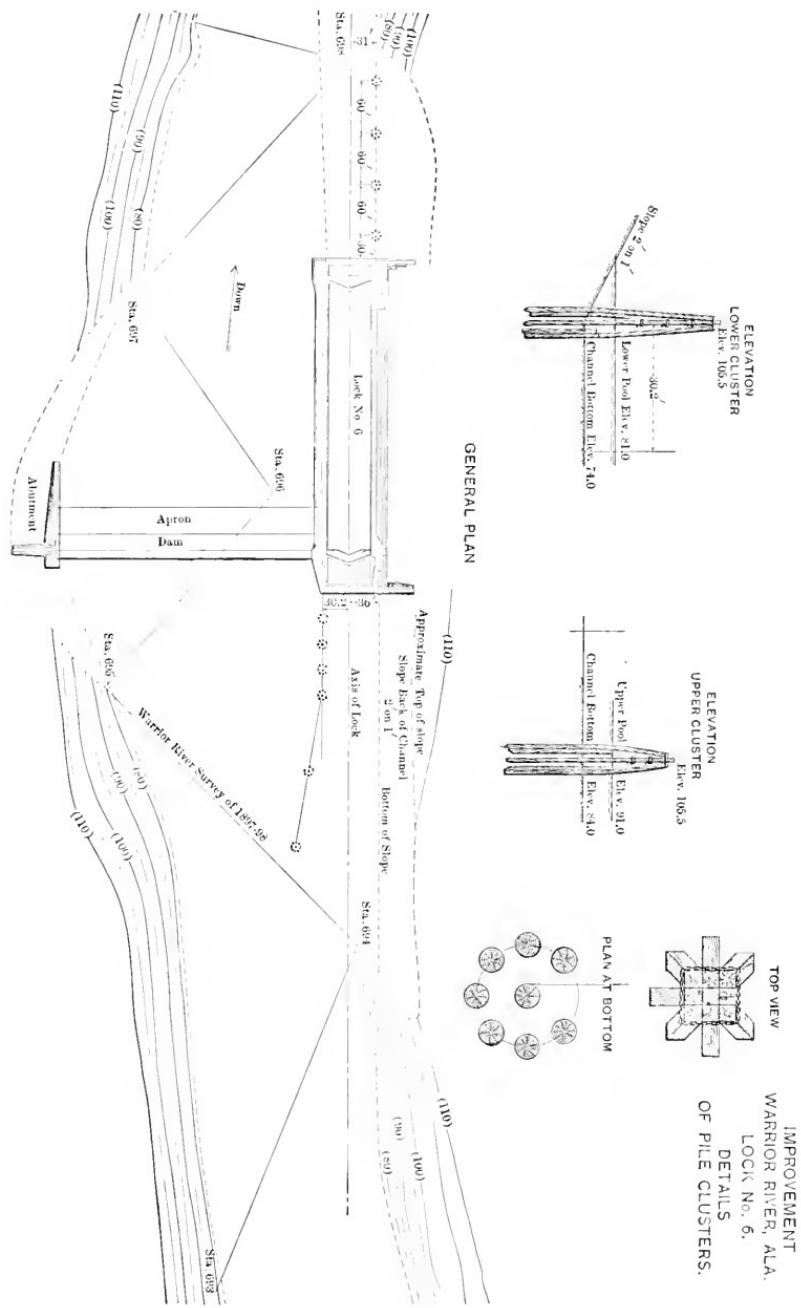
FIG. 15.

navigable when the locks are submerged. The lock walls will be about 10 ft. below ordinary high water and about 19 ft. below extreme flood, and will never be submerged except for a few days at a time. During such times the river would be unsafe for navigation, under any circumstances, and all traffic should seek harbors of refuge.

Masonry.—The walls and dams are built of sandstone quarried in the vicinity of the locks along the banks of the river and in the river bed. The stone for Lock and Dam No. 3 was quarried from the river bed just below the lock under what is now the channel for vessels. This quarry was in a reef just above falls about 7 ft. high, and was exposed by building a dam and training wall out from the shore and down to the falls. It covered about 2 acres of the river bed, and was 12 to 18 ft. deep. It was operated during the low-water period, only, and was drained with two 3-in. pulsometers. It yielded a hard, durable sandstone at a very reasonable cost, as there was no stripping.

All masonry is founded on bed-rock, the exposed faces of the lock and abutment walls being built of cut stone and the interior and back, where not exposed, of uncut rubble. The foundations for the faces of the lock walls and culverts are excavated to the grade of the lock floor, the rear of the walls being stepped up on the original bed-rock, only loose and soft rock being removed. Weep holes for drainage are left in the lower wing of the abutment and in the lower wing of the lock bank wall; also, a portion of the rear of the lock bank-wall is built of dry rubble thoroughly bonded into the mortar part of the wall. This serves as a drain for the back-filling, and reduces the cost of the wall without materially reducing its weight. Pointing is done as the work progresses, so that the pointing and other mortar may set together.

A small quantity of Louisville natural cement, 1 of cement to 2 of sand, was used in beginning Lock No. 1. With this exception, Portland cement has been used throughout. At Locks Nos. 1, 2 and 3 the cement was measured loose and the face stones were set in mortar composed of 1 of cement and 3 of sand. Some of the rubble was built up in similar mortar, some was grouted, and some had the interstices filled with concrete composed of 1 of cement, 3 of sand and 5 of broken stone, rammed in place. At Lock No. 4 the cement is measured packed, and the face stones are set in mortar composed of 1 of cement and 3 of



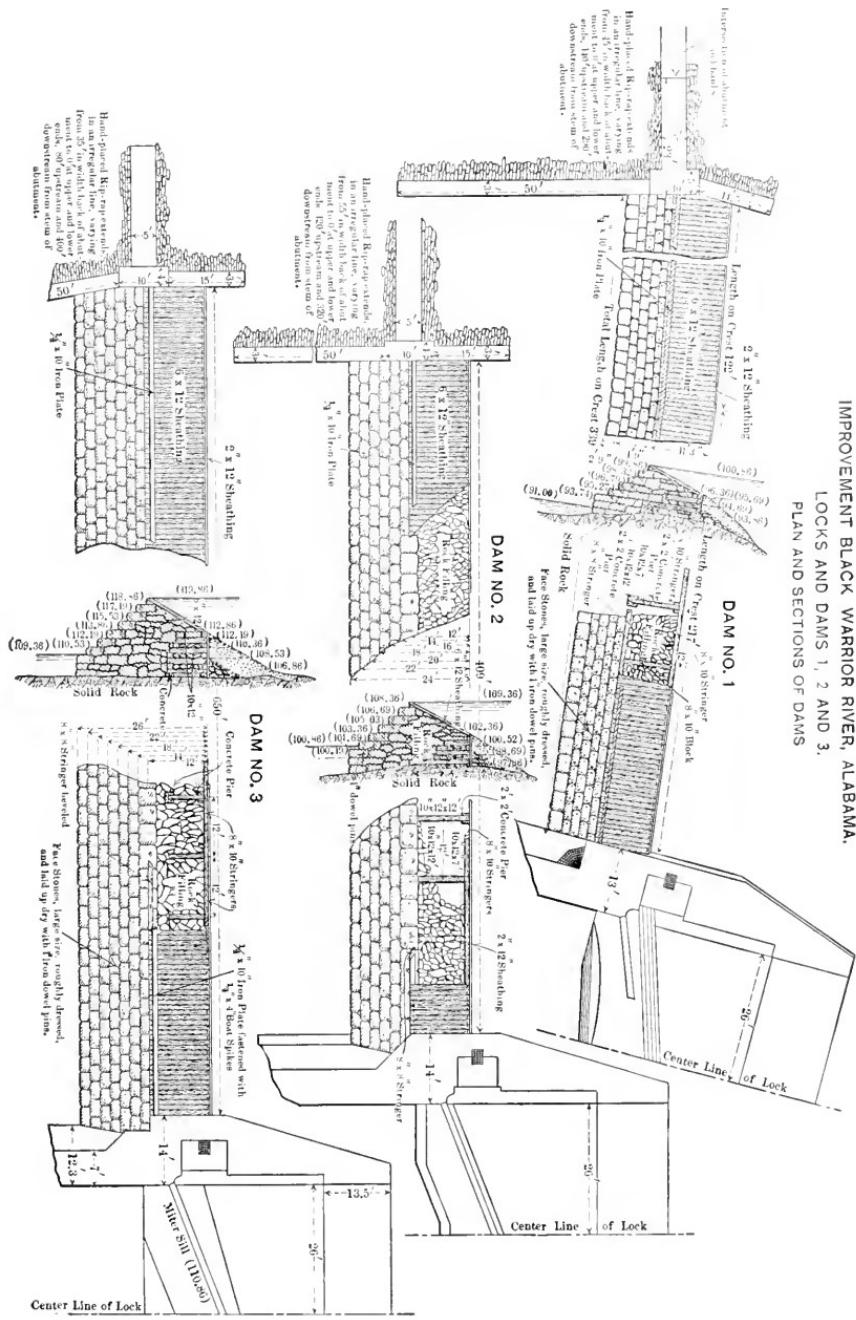
sand. The rubble is bedded and built up in concrete composed of 1 of cement, 3 of sand, and 5 of clean pebbles, the concrete being thoroughly rammed into the interstices. The stability of the walls is about the same as those for the Warrior locks. See Fig. 20.

Dams.—Movable dams were not considered for the Black Warrior System, because open-river navigation is not practicable on this portion of the stream under any conditions. Dams Nos. 1, 2 and 3 are of the rock-fill type, without mortar or core-wall. The down-stream face is composed of large roughly dressed stones, laid in steps and dowelled together. A timber crib is built into the up-stream face and sheathed. A timber wale is anchor-bolted to the top course of dressed stones, and a sloping crest of timber is drift-bolted to this wale and to the top of the crib in the up-stream face. These three dams were built during the low-water seasons, without coffer-damming. A floating derrick was used above the dams, and stationary derricks erected on the bed-rock reefs were used below the dams and were moved ahead as the building progressed. The stone for Dams Nos. 1 and 2 was delivered by barge, and for Dam No. 3 by rail, a track being laid on stone-filled cribs along the toe of the dam. The low-water flow of the stream ran through the rock-fill dams until all the stone-work and the timber crest were in place. Then the vertical sheathing on the up-stream face and the filling above the dams were placed, and the pools filled in a short time.

These dams are very cheap, but not altogether satisfactory. The filling above the dams is not permanent, and has to be renewed from time to time. The leakage is so great that at times it is difficult to keep the pools full. On certain stages there is a strong "back lash" below the dams, which holds and tosses drift sometimes for a day or two before it can get away. Saw logs, and other heavy drift, at such times, if they come back "end on" in the "back lash," dive when they reach the sheet of water falling over the crest, and strike the step stones in the down-stream face of dams like so many battering rams. This action of the drift made several large breaches in the down-stream faces of the dams, there being no dowels in the face stones when the dams were first built. Afterward, two $1\frac{1}{4}$ -in. dowel pins were put through each face stone into the stones below. No large breaches, but several small ones, have occurred since the face stones were dowelled. The crests of these dams have settled as much

**IMPROVEMENT BLACK WARRIOR RIVER, ALABAMA.
LOCKS AND DAMS 1, 2 AND 3.
PLAN AND SECTIONS OF DAMS**

PLAN AND SECTIONS OF DAMS



as 4 ins. in places, and the bed-rock, below the dams which have no aprons, is wearing from the action of the water and drift. It is probably just a question of time when these dams will have to be rebuilt or extensively repaired. See Fig. 17.

The objections to this type of dam led to a different design for Dam No. 4, which is being built of rubble masonry in mortar and concrete, but with timber coping to reduce cost. The face stones are laid in mortar composed of 1 of packed cement and 3 of sand. The interior stones are bedded and built up in concrete composed of 1 of packed cement, 3 of sand and 5 of clean pebbles. Both faces are carefully pointed as the work progresses. The down-stream face is built of large stones roughly dressed, with a straight batter of 6 ins. per foot. It is thought that this type of dam will be tight and will suffer little injury from drift playing below; also, the down-stream toe is carried well down into bed-rock, which will have to wear to the bottom of the toe before the dam can begin to undermine. Thus the bed-rock will be utilized as an apron, and should it wear enough to endanger the dam it can be replaced with an artificial apron. It is probable that a concrete dam of ogee section would be better and cheaper for such conditions, and will be built with the locks projected above Dam No. 4. See Fig. 18.

Gates.—The gates for Locks Nos. 1, 2 and 3 are built of steel, and are of the mitering, horizontal-girder type, with a single skin of $\frac{1}{4}$ -in. plates on the water side. The girders are 20-in. I-beams, with a $\frac{3}{4}$ -in. camber against the water pressure. The beams are all the same size, the spacing decreasing from the top to the bottom of the gate to provide for the increase of pressure, and are fastened to the miter and heel posts with connecting angles. The bottom beam bears against the miter-sill cushion, the bearing surface of which has a $\frac{3}{4}$ -in. camber to fit the beam.

The miter posts are of oak, backed with a steel plate $\frac{5}{8}$ in. thick. The heel posts are of cast iron, and are similar to those for the Warrior locks, but larger in diameter, owing to the greater depth of the ends of the girders. The top gudgeon is of soft steel, and is turned and pressed into the top of the heel post, which is flush with the coping. The yoke, therefore, comes above the coping, and is connected with turnbuckles to the anchorages, which are bolted to the top of the wall and partly countersunk. The operating lever is

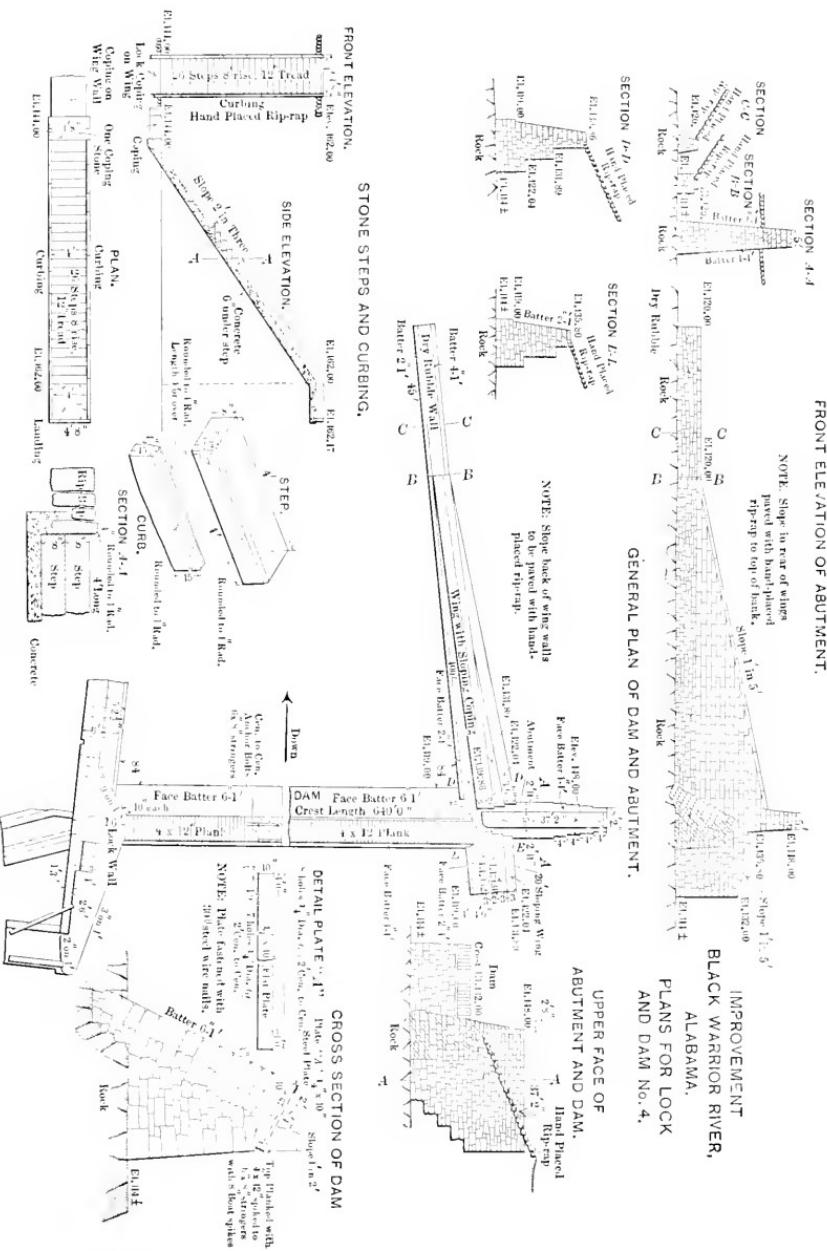


Fig. 18

fastened to the gate above the yoke, and slopes downward so that the trolley slot at the outer end hangs close to the coping. Other features of these gates are similar to those of the Warrior locks.

The gates for Lock No. 4 are similar in design to those for the Warrior locks, except that the anchorages are countersunk and bolted to the top of the wall, instead of being built into the masonry.

Valves.—Two kinds of valves were tried at Lock No. 1. One was a flexible curtain valve of asbestos rubber cloth, stiffened on the culvert side with horizontal iron slats slightly separated and riveted to the cloth. This valve was lifted from the bottom, peeling up, instead of rolling, by means of gearing on the walls and counterweights working in wells. These valves were used for several years, but did not prove durable or satisfactory, and were finally replaced with valves similar to those for the Warrior locks.

The other valve used at Lock No. 1 is a cast-iron, balanced gate with a vertical axis. The casting is in one piece, with horizontal stiffening ribs, and is cast around the steel center shaft, the ends of which are turned for journals. The frame consists of oak sills bolted into recesses in the masonry and lined with wrought-iron valve bearings. The valve revolves in cast journal boxes bolted to the oak sills. A steel rod, with a socket on the bottom end fitting over the square top of the valve shaft, extends up to the top of the wall, where it is revolved to open or close the valve by a simple lever fastened to the top of the rod. This same valve is in use at Locks Nos. 2 and 3, and has proved fairly satisfactory. The journal boxes and frame linings work loose, and wear more or less, and several of the valves were cracked shortly after being erected, probably due to water hammer caused by closing the valves suddenly against a head of water. Also, the valve cannot be operated as smoothly with the single lever as with the worm gear. The steel valve operated by the worm gear is considered, on the whole, safer and more durable.

The valves for Lock No. 4 are similar in design to those for the Warrior locks.

Coffer Timbers, Etc.—When Locks Nos. 1, 2 and 3 were built, light needle-dams, extending about 2 ft. above the pool level, were provided at the upper ends, but no provision for coffer-dams was made at the lower ends. The erection of the needle-dam exposes the upper gates and valves, which are entirely above the lower pool level. When repairs

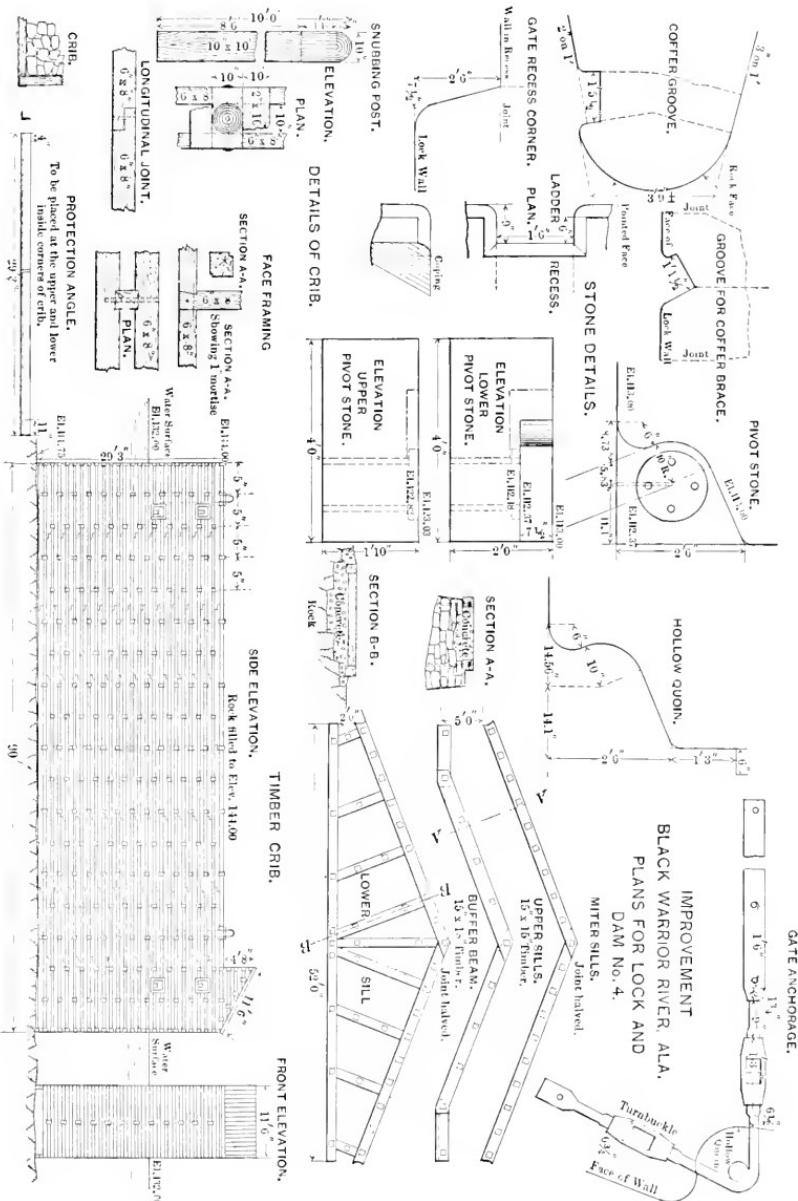


FIG. 19

are needed to the lower gates and valves, or when the lock chambers need cleaning out, there being no dredge available, the practice has been to draw each pool down at low water through the lock below, raise the needle-dam at the upper end, put in a low, cheap, temporary coffer-dam of clay or canvas at the lower end, and pump out. The objection to this method is that it is only available at low water, and a very slight rise will flood the pool below, while a rise of over 2 ft. will flood the needle-dam above. This renders repair work quite precarious. Also, in order to drain a pool, it is necessary to lash open the gates of the lock below and turn the river through the lock. This leaves the lock in bad condition in case of a sudden rise. One gate has recently been greatly injured under these circumstances by being torn from its lashings and slammed against the miter sill by the current. It had to be taken down, repaired, and re-erected.

The pools below Dams Nos. 2 and 3 are quite short, and can be drained quickly at low water. So far, there has been an open river below Dam No. 1, but the next dam below, Warrior No. 6, will probably be built during 1902. This will make a pool 46 miles long below Dam No. 1, which cannot be drained quickly, or without damage to commerce, even at low water. Therefore, during 1901, provision was made at the lower end of Lock No. 1 for a permanent coffer-dam, 5 ft. above the pool level and otherwise similar to those for the Warrior locks. Similar coffer-dams will probably be provided, later, at the lower ends of Locks Nos. 2 and 3.

The needle-dams in use at Locks Nos. 1, 2 and 3 are erected on masonry breast walls extending across the heads of the locks and up to within about 7 ft. of the pool level. The needles are each 4 ins. wide, and are placed against two sills. The bottom sill is built and anchored into the masonry of the breast wall. The top sill rests at each end in recesses cut in the faces of the lock walls, and is supported at intervals of about $7\frac{1}{2}$ ft. by steel trestles anchored to the breast wall and hinged so that when not in use they lie flat upon it. The needles, when in place, slope down stream at an angle of about 20° from the vertical. These needle-dams are quite simple and efficient, and are easily maneuvered. The principal objection to them is that they extend only 2 ft. above the pool level.

At Lock No. 4, coffer timbers at both ends, similar to those for the Warrior locks, are provided.

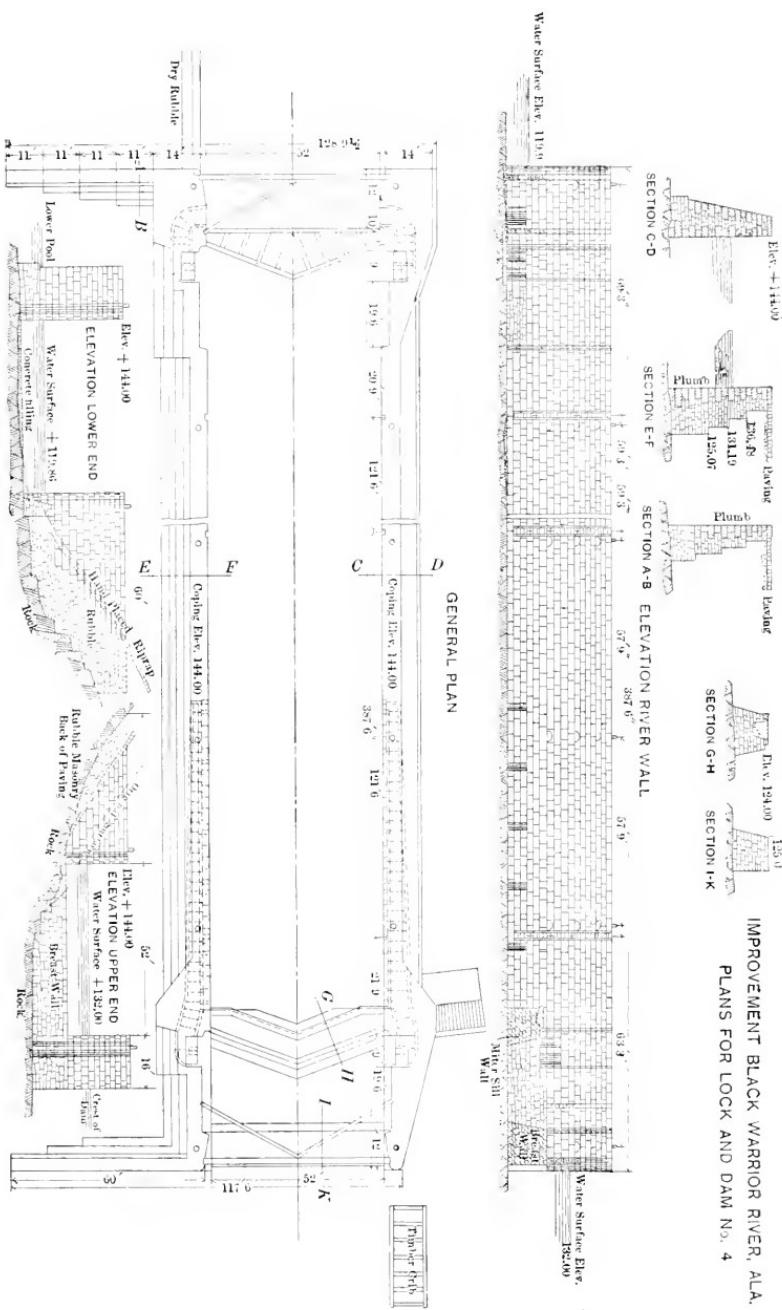


FIG. 20.

Bank Protection.—At Locks Nos. 1, 2 and 3 all bank protection consists of hand-placed rip-rap, 12 ins. thick. It covers the horizontal space between the bank-wall wings and most of the slope back of these wings, and the sloping banks for a short distance above and below each lock; also the sloping banks for short distances above and below each lock; also the sloping banks for a short distance above and for about 300 ft. below each abutment. Immediately back of the locks and abutments this protection extends well up toward the top of the slope, but tapers down toward the low-water line at the lower end. This rip-rap slips in places, after floods, and requires more or less repairs each season, but, on the whole, has served its purpose well. In places it is now covered with willows and other vegetation, which help to hold it in place. The banks here consist largely of clay, and do not erode so readily as the alluvial banks of the Warrior.

The bank protection at Lock No. 4 will be similar to that at Locks Nos. 1, 2 and 3, except that well-shaped stone paving 15 ins. thick will be used on the horizontal space between the bank-wall wings.

Guard Cribs.—When Locks Nos. 1, 2 and 3 were built, a single guard crib, 90 ft. long and $11\frac{1}{2}$ ft. wide, was placed above and in line with the river wall at each lock, a space of 10 ft. being left between the crib and the lock wall for the passage of drift. The top of the crib was level with the coping of the lock, and a sloping drift guard on the upper end of the crib extended 5 ft. higher. The cribs were built of 6 x 8-in. yellow pine, with cross-pieces at intervals of 5 ft., drift-bolted together, and filled with “one man” stone.

At certain stages the suck of the dam causes a strong current around the head of the crib. This caused the wreck of a towboat and several barges in February, 1901, they being drawn over the dam while maneuvering to enter the head of Lock No. 2. To afford better protection to traffic, four additional cribs, 24 ft. long and 12 ft. wide, with 21-ft. openings between them for drift, are now being built above each of the old cribs. The new cribs are on a line flaring 10° at Locks Nos. 1 and 2, and 15° at Lock No. 3, toward the river from the line of the old crib, and extend the protection to a total distance of 280 ft. above the head of lock. It is probable that, should fleets ever be handled that will require two or more lockages to pass a lock, guard cribs with snubbing posts will be required below and in line with the bank walls, but none have yet been built or provided for.

PLATE XVIII.
PAPERS, AM. SOC. C. E.
APRIL, 1902.
McCALLA ON IMPROVEMENT OF RIVERS.

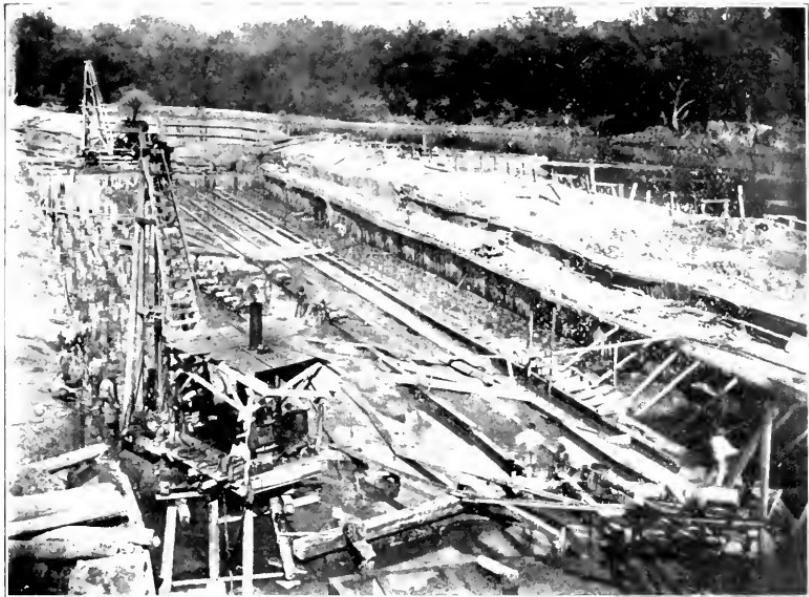


FIG. 1.—WARRIOR RIVER: SITE OF LOCK NO. 5, LOOKING UP STREAM.



FIG. 2.—WARRIOR RIVER: LOCK NO. 6, SHOWING CONCRETE FORMING.

A single crib, similar to those first built at Locks Nos. 1, 2 and 3, is provided for at Lock No. 4, but it is probable that additional cribs will be needed there also. (See Fig. 19.)

Other Features.—With given lifts, the location of each lock is largely fixed by the profile of the stream, and there is little choice between different sites. As far as practicable, the locks are placed on a convex shore, to secure protection from drift, and straight approaches. No mounds have been built at the Black Warrior locks, because there has been no surplus excavation and the river banks are much higher than at the Warrior locks. The lock floors consist of bed-rock, as left after excavating to grade, and are quite rough. The culverts and other details not mentioned are similar to those described for the Warrior locks.

COST.

As stated previously, the total cost of these improvements will approximate \$5 000 000, or \$250 000 per lock and dam.

Tombigbee System.—The work on Lock and Dam No. 1 is about three-fifths completed. No detailed estimates of the cost of completing this and building Locks and Dams Nos. 2 and 3 have yet been made. The cost of concrete in place at Lock No. 1 was about \$6.34 per cubic yard, under fair working conditions, but this did not include the cost of coffer-dams and other incidental expenses.

Warrior System.—The estimated cost of Locks and Dams Nos. 1, 2 and 3 is \$874 000, as itemized in Table No. 2.

TABLE No. 2.

LOCK NO. 1.		Measure.	Quantity.	Price.	Amount.
Kind of work and material.					
Concrete.....	Cubic yards.	12 000	\$7.50	\$90 000	
Excavation.....	"	260 000	0.35	91 900	
Gravel filling.....	"	1 000	1.00	1 000	
Stone filling.....	"	7 000	2.50	17 500	
Rip-rap.....	"	4 000	2.50	10 000	
Puddling.....	"	100	1.50	150	
Miter sills.....	Feet, B. M.	4 000	50.00	200	
Dam timber.....	"	320 000	30.00	9 600	
Apron timber.....	"	110 000	25.00	2 750	
Floor timber.....	"	116 000	40.00	4 640	
Sheathing.....	"	20 000	20.00	400	
Sheet-piling.....	"	550 000	40.00	22 000	
Foundation piles.....	Linear feet.	50 000	0.30	15 000	
Heart piles.....	"	6 000	0.35	2 100	
Drain pipes.....	"	500	0.50	250	
Grubbing and clearing.....	Complete.			1 000	
Coffer-dams.....				10 000	
					\$277 500
Purchase of sites.....					2 000
Gates, valves and irons.....					15 000
Buildings.....					5 000
Engineering and incidentals.....					33 410
Total.....					\$333 000
LOCK NO. 2.					
Concrete.....	Cubic yards.	12 000	\$7.50	\$90 000	
Excavation.....	"	135 000	0.35	47 250	
Gravel filling.....	"	1 000	1.00	1 000	
Stone filling.....	"	4 000	2.50	10 000	
Rip rap.....	"	2 900	2.50	7 250	
Puddling.....	"	100	1.50	150	
Miter sills.....	Feet, B. M.	4 000	50.00	200	
Dam timber.....	"	195 000	30.00	5 850	
Apron timber.....	"	66 000	25.00	1 650	
Floor timber.....	"	116 000	40.00	4 640	
Sheathing.....	"	20 000	20.00	400	
Sheet-piling.....	"	465 000	40.00	18 600	
Foundation piles.....	Linear feet.	48 000	0.30	14 400	
Heart piles.....	"	6 000	0.35	2 100	
Drain pipe.....	"	500	0.50	250	
Grubbing and clearing.....	Complete.			1 000	
Coffer-dams.....				8 000	
					\$212 740
Purchase of sites.....					500
Gates, valves and irons.....					15 000
Buildings.....					5 000
Engineering and incidentals.....					26 760
Total.....					\$260 000

TABLE No. 2—(*Continued*).

LOCK No. 3.				
Kind of work and material.	Measure.	Quantity.	Price.	Amount.
Concrete.....	Cubic yards,	12 000	\$7.50	\$90 000
Excavation.....	"	175 000	0.35	61 250
Gravel filling.....	"	1 000	1.00	1 000
Stone filling.....	"	3 600	2.50	9 000
Rip-rap.....	"	3 600	2.50	9 000
Puddling.....	"	100	1.50	150
Miter sills.....	Feet, B. M.	4 000	50.00	200
Dam timber.....	"	195 000	30.00	5 850
Apron timber.....	"	66 000	25.00	1 650
Floor timber.....	"	116 000	40.00	4 640
Sheathing.....	"	20 000	20.00	400
Sheet-piling.....	"	520 000	40.00	20 800
Foundation piles.....	Linear feet.	55 000	0.30	16 500
Heart piles.....	"	6 000	0.35	2 100
Drain pipe.....	"	500	0.50	250
Grubbing and clearing.....	Complete.			1 000
Coffer-dams				8 000
				\$231 700
Purchase of sites.....				500
Gates, valves and irons.....				15 000
Buildings.....				5 000
Engineering and incidentals.....				28 710
Total.....				\$281 000
RECAPITULATION.				
Lock No. 1.....				\$333 000
Lock No. 2.....				260 000
Lock No. 3.....				281 000
Grand total.....				\$874 000

The Bids received for Locks and Dams Nos. 4, 5 and 6 are shown in Table No. 3.

Miter sills.....	4 000	\$14.00	\$176.00	\$50.00	\$200.00	\$45.00	\$180.00	\$50.00	\$200.00	\$36.00	\$144.00
barn timber.....	500	4 950.00	37.50	6 412.50	32.50	5 557.50	50.00	5 130.00	29.00	4 650.00	4 650.00
Apron timber.....	174 040	24.50	425.00	1 641.50	25.00	1 675.00	30.00	2 010.00	25.00	1 675.00	1 285.40
Floor timber.....	175 000	30.00	540.00	3 980.00	30.00	3 840.00	30.00	3 920.00	40.00	4 480.00	
Sheathing.....	112 000	30.00	400.00	13 290.00	50.00	1 000.00	30.00	600.00	20.00	400.00	
Sheet-piling.....	39 000	20.00	780.00	13 270.00	50.00	13 250.00	60.00	10 800.00	50.00	13 500.00	
Foundation piles.....	50 000	50.00	2 000.00	16 300.00	40.00	20 000.00	0.25	12 500.00	0.20	10 000.00	0.25
Heart piles.....	2 000	0.32	680.00	1.00	2 000.00	0.50	1 000.00	0.25	500.00	0.30	
Drain pipe.....	500	1.00	500.00	0.60	200.00	0.28	100.00	0.50	250.00	250.00	
Gribbing and clearing.....			200.00	200.00	200.00	4 600.00	1 000.00	1 000.00	240.00		
Totals.....											
Alternative quantities:											
Stone filling.....	3 600	\$22.00	\$72 000.00	\$5 500.00	\$18 000.00	\$2 500.00	\$9 000.00	\$8.60	\$12 300.00	\$1.14	\$4 104.00
Stone paving.....	1 650	6.00	11 550.00	5.50	9 075.00	6.50	10 725.00	3.60	5 940.00	2.70	4 455.00
Riprap (hand-placed)	1 200	2.50	3 000.00	5.25	6 300.00	3.50	4 200.00	3.10	3 720.00	1.20	1 440.00
Concrete.....	Cubic yards.	11 200	\$7.50	\$84 003.00	\$10.00	\$112 000.00	\$0.00	\$100 800.00	\$6.48	\$22 576.00	\$6.00
Excavation.....	"	76 000	58.00	38 000.00	0.50	38 000.00	0.40	30 400.00	0.31	22 560.00	
Gravel filling.....	"	4 000	0.75	3 000.00	0.50	2 800.00	1.00	4 000.00	1.00	4 000.00	0.42
Puddling.....	"	100	1.50	150.00	1.25	125.00	1.25	200.00	0.20	60.00	2 400.00
Mattress work.....	Square yards.	5 000	4.00	4 000.00	1.00	5 000.00	1.00	5 000.00	0.50	2 500.00	0.48
Puddling.....	Feet, B. M.	4 000	44.00	176.00	50.00	200.00	45.00	180.00	50.00	300.00	144.00
Miter sills.....	"	155 000	20.00	4 450.00	35.00	5 425.00	22.50	5 057.50	30.00	4 650.00	4 495.00
Dam timber.....	"	67 000	21.50	1 641.50	25.00	1 675.00	20.00	2 010.00	25.00	1 675.00	1 286.40
Apron timber.....	"	112 000	30.00	3 360.00	30.00	3 360.00	35.00	3 920.00	35.00	4 480.00	
Floor timber.....	"	29 000	40.00	50.00	30.00	1 000.00	30.00	600.00	20.00	400.00	340.00
Sheathing.....	"	20 000	50.00	18 750.00	60.00	16 500.00	40.00	11 060.00	50.00	13 750.00	16.00
Sheet-piling.....	Linear feet.	55 000	0.32	17 600.00	0.50	27 500.00	0.25	13 750.00	0.20	11 060.00	0.20
Foundation piles.....	"	34 000	1.00	2 100.00	0.50	1 050.00	0.25	1 286.40	0.25	630.00	
Heart piles.....	"	500	0.60	300.00	0.28	140.00	0.50	250.00	0.50	250.00	240.00
Drain pipe.....	"	1,000	200.00	4 000.00	....	4 000.00	....	1 000.00	....	
Gribbing and clearing.....	Complete.										
Totals.....											
		\$172 486.50		\$219 985.00	....	\$190 212.50	....	\$147 046.00	....	\$335 640.40	

Lock and Dam No. 6.

IMPROVEMENT OF RIVERS.

Papers.]

TABLE No. 3.
Lock and Dam No. 4.

Items.	Measure.	Quantity.	No. 1.		No. 2.		No. 3.		No. 4.		No. 5.	
			Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.
Concrete.....	Cubic yards.	11 300	\$7.50	\$84 750.00	\$11.00	\$124 300.00	\$9.50	\$107 350.00	\$6.48	\$73 224.00	\$5.95	\$67 255.00
Excavation.....	"	140 000	0.50	70 000.00	0.40	50 000.00	0.50	70 000.00	0.35	40 000.00	0.28	30 200.00
Gravel filling.....	"	2 925.00	1.00	3 900.00	1.00	3 900.00	1.00	3 900.00	1.00	3 900.00	0.42	1 628.00
Puddling.....	"	100	1.50	150.00	1.25	125.00	1.25	125.00	2.00	200.00	0.60	60.00
Mattress work.....	Square yards.	6 210	0.90	5 580.00	1.00	6 210.00	1.00	6 210.00	0.50	3 100.00	0.48	2 976.00
Miter sills.....	"	4 000	44.00	176.00	50.00	200.00	45.00	180.00	50.00	200.00	36.00	144.00
Bam timber.....	Feet, B. M.	155 000	25.00	4 495.00	40.00	6 200.00	32.50	5 057.00	30.00	4 450.00	22.00	4 405.00
Apron timber.....	"	67 000	24.50	1 641.50	27.50	1 842.50	30.00	2 010.00	25.00	1 675.00	19.20	1 328.40
Floor timber.....	"	112 000	30.00	3 380.00	32.50	3 610.00	35.00	3 920.00	35.00	3 920.00	10.00	4 480.00
Sheathing.....	"	29 000	20.00	400.00	50.00	500.00	30.00	600.00	20.00	400.00	17.00	340.00
Sheet-piling.....	"	275 000	50.00	13 750.00	60.00	16 500.00	40.00	11 000.00	50.00	13 750.00	50.00	13 750.00
Foundation piles.....	Linear feet.	44 000	0.32	14 080.00	0.40	17 600.00	0.25	11 000.00	0.25	8 800.00	0.20	12 760.00
Heart piles.....	"	2 000	0.34	680.00	1.00	2 000.00	0.50	1 000.00	0.25	500.00	0.30	600.00
Drain pipe.....	"	500	1.00	500.00	0.60	300.00	0.28	140.00	0.50	250.00	0.50	250.00
Gentling and clearing.....	Complete,	"	"	290.00	"	5 000.00	"	4 600.00	"	1 000.00	"	240.00
Totals.....				\$202 687.50		\$244 807.50		\$225 062.50		\$164 560.00		\$149 454.40

Alternative quantities:												
Concrete.....	Cubic yards.	3 100	\$2.00	\$6 290.00	\$5.60	\$15 500.00	\$2.50	\$7 750.00	\$3.75	\$11 625.00	\$1.14	
Excavation.....	"	45 000	0.50	22 500.00	0.50	22 500.00	0.50	22 500.00	0.32	14 400.00	\$23 800.00	
Gravel filling.....	"	4 400	0.75	3 300.00	1.00	4 400.00	1.00	4 400.00	0.42	1 818.00	2 150.00	
Puddling.....	"	100	1.50	150.00	1.25	125.00	2.00	4 300.00	0.48	1 000.00	2 520.00	
Mattress work.....	Square yards.	3 600	0.90	3 240.00	1.00	3 600.00	1.00	3 600.00	0.50	1 800.00	0.48	1 728.00

Lock and Dam No. 5.

TABLE No. 3—(*Continued*)

Items.	Measure.	No. 1.		No. 2.		No. 3.		No. 4.		No. 5.	
		Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.	Quantity.	Price.
Alternative quantities:											
Stone filling.....	Cubic yards.	3.200	\$2.00	36.400.00	\$4.00	\$12.960.00	\$2.50	\$8.000.00	\$3.50	\$11.200.00	\$1.14
Stone paving.....	"	950	7.00	6.650.00	4.50	4.375.00	6.50	6.175.00	3.50	3.325.00	2.70
Rip-rap (hand-placed)	"	1.700	2.50	4.250.00	4.25	1.825.00	3.50	5.950.00	3.00	5.100.00	1.20

Smith

The work was let to the lowest bidders, at the prices given in bid No. 5. The latest estimate of the total cost of these three locks and dams is \$516,713, itemized as follows:	
'Contract with lowest bidders.....	\$ 45,869
Purchase of sites.....	1,524
Gates, valves and irons.....	45,400
Buildings.....	15,000
Engineering and incidentals.....	96,000
	96,000

This will make a total cost of \$1,490.73, for the Warrior System of six locks and dams ^{total.}

Black Warrior System.—The total cost of Locks and Dams Nos. 1, 2 and 3, including local office expenses, but not including office expenses at the district headquarters in Mobile, was \$541,215.57, itemized as in Table No. 4.

TABLE No. 4.

Lock and Abutment No. 1.

(Lock masonry, 9,762 cu. yds.; abutment masonry, 325 cu. yds.)

Item.	Measure.	Quantity.	Cost.	Rate, per unit.
Stone quarried.....	Cubic yards.	10,087	\$34,400.96	\$3.410+
Stone cut	"	3,530	37,637.27	10.602+
Masonry laid, including cement.....	"	10,087	25,474.97	2.525+
Earth excavation.....	"	10,809	3,016.99	0.379+
Rock excavation.....	"	3,778	5,014.38	1.327+
Earth filling.....	"	4,500	1,115.65	0.254+
Rock filling.....	"	2,500	1,238.98	0.495+
Paving 12 ins. thick.....	Square yards.	6,774	2,199.52	0.222+
Turfing	"	3,132		
Gates and valves.....			12,010.50	
Coffer-dam and pumping.....			8,555.54	
Handling and hauling.....			20,273.22	
Boats and buildings.....			1,518.44	
Track and roads.....			10,882.29	
Tools and plant.....			28,535.18	
Engineering and superintendence.....			19,404.90	
Incidentals.....			6,771.01	
Total.....			\$221,078.90	

Dam No. 1.

(Dam 10 ft. high, 339 ft. long, and 21 ft. width of base.)

Lumber and iron.....	Feet, B. M.	36,238	\$1,010.65	\$27,889+
Carpenter work.....	"	36,238	336.30	9,289+
Stone quarried.....	Cubic yards.	1,467	5,003.09	3,410+
Stone, rough-dressed.....	"	360	1,059.41	2,942+
Masonry laid, dry rubble.....	"	1,467	1,243.11	0.847+
Earth excavation.....	"	329	60.04	0.182+
Filling above dam.....	"	502	425.00	0.846+
Handling and hauling.....			465.22	
Track and roads.....			100.13	
Tools and plant.....			554.90	
Engineering and superintendence.....			477.04	
Incidentals.....			143.73	
Total.....			\$10,878.62	

Guard Crib No. 1.

(Guard Crib 29 ft. 10 ins. high, 90 ft. long, and 11 ft. 8 ins. wide.)

Lumber and iron.....	Feet, B. M.	34,453	\$470.10	\$13,653+
Carpenter work.....	"	34,453	239.07	6,939+
Filling rock.....	Cubic yards.	1,640	567.51	0.346+
Total.....			\$1,276.98	

TABLE No. 4—(*Continued*).*Lock and Abutment No. 2.*

(Lock masonry, 10 723 cu. yds.; abutment masonry, 559 cu. yds.)

Item.	Measure.	Quantity.	Cost.	Rate, per unit.
Stone quarried.....	Cubic yards.	11 282	\$16 509.14	\$1.463+
Stone cut.....	"	3 595	25 744.53	7.161+
Masonry laid, including cement.....	"	11 282	21 330.53	1.890+
Earth excavation.....	"	6 876	1 636.01	0.237+
Rock excavation.....	"	941	995.57	1.057+
Earth filling.....	"	6 552	1 351.86	0.206+
Paving, 12 ins. thick.....	Square yards.	8 307 1/4	2 039.52	0.217+
Turfing	"	1 021 1/4	9 698.45	.....
Gates and valves.....			2 462.10	.....
offer-dam and pumping.....			10 002.62	.....
Handling and hauling.....			3 441.87	.....
Boats and buildings.....			9 867.23	.....
Track and roads.....			22 512.68	.....
Tools and plant.....			13 841.16	.....
Engineering and superintendence.....			5 507.40	.....
Incidentals.....				
Total.....			\$146 880.67	.....

Dam No. 2.

(Dam 13 ft. high, 410 ft. long, and 24 ft. width of base.)

Lumber and iron.....	Feet, B. M.	53 556	\$850.91	\$15.888+
Carpenter work.....	"	53 556	381.80	7.128+
Stone quarried.....	Cubic yards.	3 646	3 350.85	0.919+
Stone, rough-dressed.....	"	373	631.37	1.692
Masonry laid, dry rubble.....	"	3 646	1 868.20	0.512+
Earth excavation.....	"	360	45.85	0.127+
Filling above dam.....	"	607	401.99	0.662+
Cement			135.00	.....
Handling and hauling.....			586.54	.....
Track and roads.....			105.48	.....
Tools and plant.....			964.03	.....
Engineering and superintendence.....			1 081.62	.....
Incidentals.....			497.61	.....
Total.....			\$10 902.25	.....

Guard Crib No. 2.

(Guard crib 28 ft. 8 ins. high, 90 ft. long, and 11 ft. 6 ins. wide.)

Lumber and iron.....	Feet, B. M.	33 109	\$419.80	\$12.679+
Carpenter work.....	"	33 109	226.17	6.831+
Filling rock.....	Cubic yards.	1 105	263.38	0.238+
Total.....			\$909.35	.....

Lock and Abutment No. 3.

(Lock masonry, 10 885 cu. yds.; abutment masonry, 530 cu. yds.)

Stone quarried.....	Cubic yards.	11 415	\$18 923.33	\$1.657+
Stone cut.....	"	3 997	24 057.88	6.018+
Masonry laid, including cement.....	"	11 415	20 691.09	1.812+
Earth excavation.....	"	3 529	910.35	0.257+
Rock excavation.....	"	2 500	2 501.68	1.000+
Earth filling.....	"	7 496	2 156.41	0.287+
Paving, 12 ins. thick.....	Square yards.	7 036	9 966.43	0.137+
Gates and valves.....			8 510.01	.....
Handling and hauling.....			3 415.21	.....
Boats and buildings.....			2 622.80	.....
Track and roads.....			17 852.08	.....
Tools and plant.....			13 892.26	.....
Engineering and superintendence.....			5 712.64	.....
Incidentals.....				
Total.....			\$131 561.47	.....

TABLE No. 4—(*Concluded*).*Dam No. 3.*

(Dam 15 ft. high, 650 ft. long, and 26 ft. width of base.)

Item.	Measure.	Quantity.	Cost	Rate, per unit.
Lumber and iron.....	Feet, B. M.	93 759	\$1 274.55	\$13.50+
Carpenter work.....	"	93 759	689.77	7.356+
Stone quarried.....	Cubic yards.	6 130	4 153.50	0.677+
Stone, rough-dressed.....	"	893	1 403.10	1.471+
Masonry laid, dry rubble.....	"	6 130	1 916.10	0.312+
Filling above dam.....	"	1 444	868.85	0.601+
Cement.....			135.00	.....
Handling and hauling.....			1 168.34	.....
Track and roads.....			635.48	.....
Tools and plant.....			2 668.77	.....
Engineering and superintendence.....			1 278.22	.....
Incidentals.....			145.15	.....
Total.....			\$16 336.83	.....

Guard Crib No. 3.

(Guard crib 28 ft. 8 ins. high, 90 ft. long, and 11 ft. 6 ins. wide.)

Lumber and iron.....	Feet, B. M.	33 109	\$468.97	\$14.164+
Carpenter work.....	"	33 109	417.95	12.623+
Filling rock.....	Cubic yards.	1 090	503.58	0.462+
Total.....			\$1 390.50	.....

SUMMARY.

Cost of Lock and Dam No. 1.....	\$239 234.50
Cost of Lock and Dam No. 2.....	158 692.27
Cost of Lock and Dam No. 3.....	149 288.80
Grand total.....	\$541 215.57

The unit cost of Lock and Dam No. 3 was considerably below that of Nos. 1 and 2, due to favorable conditions and the rapid prosecution of the work. The masonry was begun on June 15th, 1893, and the lock walls were finished on November 8th, 1893. The entire masonry of the lock was completed, ready for the gates and valves, on December 26th, 1893.

Analyzing the cost of Lock and Abutment No. 3 gives the percentages shown in Table No. 5.

TABLE No. 5.

Items.	Cost.	Percentage.
Earth excavation.....	\$910.35	0.7
Paving.....	966.43	0.7
Track and roads.....	2 622.80	1.5
Earth filling.....	2 156.41	1.6
Rock excavation.....	2 501.68	1.9
Boats and buildings.....	3 445.21	2.6
Incidentals.....	5 712.61	4.4
Handling and hauling.....	8 510.01	6.5
Gates and valves.....	9 919.30	7.4
Engineering and superintendence.....	13 892.26	10.6
Tools and plant.....	17 852.08	13.6
Quarrying.....	18 923.33	14.4
Cement and laying stone.....	20 691.00	15.8
Stone cutting.....	21 057.88	18.3
Totals	\$131 561.47	100

The following items do not properly enter into the cost of the masonry:

Earth excavation	\$910.35
Rock excavation.....	2 501.68
Earth filling.....	2 156.41
Paving.....	966.43
Gates and valves.....	9 919.30
Lock tender's house.....	1 705.76
	\$18 159.93

This gives a total cost of \$113 401.54 for 11 415 cu. yds. of all classes of masonry, or \$9.934 + per cubic yard.

Analyzing the cost of Dam No. 3 gives the percentages shown in Table No. 6.

TABLE No. 6.

Items.	Cost.	Percentage.
Cement.....	\$135.00	0.8
Incidentals.....	145.15	0.9
Track and roads.....	635.48	3.9
Carpenter work.....	689.77	4.2
Filling above dam.....	868.85	5.3
Handling and hauling.....	1 168.34	7.2
Lumber and iron.....	1 274.55	7.8
Engineering and superintendence.....	1 278.22	7.9
Dressing stone.....	1 403.10	8.6
Laying stone.....	1 916.10	11.7
Tools and plant.....	2 668.77	16.3
Quarrying	4 153.50	25.4
Totals	\$16 336.83	100

TABLE No. 7.

Items.	Measure.	Quantity.	No. 1.		No. 2.		No. 3.		No. 4.		No. 5.	
			Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.
Quoins.....	Cubic yards.	.80	\$22.00	\$1,760.00	\$25.00	\$2,000.00	\$22.00	\$1,760.00	\$22.00	\$1,760.00	\$25.00	\$2,000.00
Coping.....	"	.30	18.00	540.00	20.00	600.00	18.80	564.00	20.00	600.00	18.00	540.00
Painted-face masonry.....	"	2 2/10	12.00	25,880.00	19.00	42,560.00	13.50	30,240.00	15.00	33,600.00	15.50	34,220.00
Rock-face masonry dry.....	"	1 5/10	10.00	15,600.00	18.00	28,080.00	12.20	19,082.00	14.00	21,840.00	14.00	23,840.00
Rubble masonry.....	"	10 3/10	7.00	20,580.00	9.00	18,460.00	7.40	80,956.00	10.00	100,400.00	7.50	82,650.00
Dry rubble masonry.....	"	1 3/10	6.00	11,900.00	8.00	15,280.00	5.50	10,450.00	8.00	15,290.00	5.75	10,925.00
Excavation.....	"	10 0/10	2.00	20,000.00	1.00	10,000.00	0.30	3,000.00	0.40	4,000.00	0.50	5,000.00
Rock excavation.....	"	1 3/10	4.00	5,200.00	2.00	10,000.00	1.00	1,300.00	1.50	1,950.00	2.00	2,600.00
Embankment.....	"	5 0/10	2 5/10	2,500.00	0.75	3,250.00	0.50	1,500.00	0.30	1,500.00	0.50	2,500.00
Stone filling.....	"	2 0/10	1.25	2,500.00	1.25	2,500.00	1.25	2,500.00	1.25	2,500.00	1.25	2,500.00
Paving.....	"	1 2/10	2.50	3,000.00	2.25	2,700.00	2.00	3,000.00	1.75	1,800.00	4,800.00	2,500.00
Rip rap (hand-placed).....	"	1 5/10	2.00	3,000.00	1.75	2,625.00	1.50	1,875.00	1.25	1,875.00	2.00	3,600.00
Puddling.....	"	.50	1.00	.50	2.00	100.00	1.25	25.00	2.00	100.00	2.00	100.00
Bolt holes in masonry.....	Linear feet.	.600	.25	150.00	.50	300.00	.15	.90	.30	180.00	.20	120.00
Miter-sills.....	Feet, B. M.	3 9/10	50.00	180.00	65.00	234.00	25.00	90.00	60.00	216.00	35.00	136.00
Framed timber.....	"	30.00	2 400.00	320.00	1 840.00	1 840.00	40.00	320.00	25.00	1 600.00	15.00	150.00
Sheeting.....	"	200.00	200.00	200.00	25.00	25.00	100.00	25.00	25.00	100.00	200.00	200.00
Grubbing and clearing.....	Complete.	2 400.00	300.00	1 000.00	1 000.00	1 000.00	50.00	50.00	50.00	50.00	50.00	50.00
Total.....			\$179,900.00	.....	\$221,200.00	.....	\$163,348.00	.....	\$208,421.00	.....	\$167,331.00	.....

The following items do not properly enter into the cost of the dam masonry:

Lumber and iron.....	\$1 274.55
Carpenter work.....	689.77
Filling above dam.....	868.85
Cement	135.00

	\$2 968.17

This gives a total cost of \$13 368.66 for 6 130 cu. yds. of dry rubble dam masonry, or \$2.180 + per cubic yard.

The bids received for Lock and Dam No. 4 are given in Table No. 7.

The work was let to the lowest bidders, at the prices given in bid No. 3.

The latest estimate of the total cost of this lock and dam is \$204 500, itemized as follows:

Contract with lowest bidders.....	\$166 260
Gates, valves and irons.....	12 400
Buildings	4 400
Engineering and incidentals.....	21 440

Total.....	\$204 500

No detailed estimates of the cost of Locks and Dams Nos. 5 to 11, inclusive, have yet been made.

COMMERCIAL IMPORTANCE.

The modern tendency in the United States seems to be for railroad transportation to supersede other forms of inland transportation. As a rule, the traffic on our rivers and canals is decreasing or at a stand-still where well-managed railroads have come in competition, and the railroad traffic is steadily increasing. Also, the general tendency of railroad rates has been downward for many years, and the end is not yet.

There are several reasons for these conditions. Our rivers and canals, the vessels plying upon them, and the owners of these vessels, have, in many cases, not kept pace with modern improvements. They

PLATE XIX.
PAPERS AM. SOC. C. E.
APRIL, 1901.
McCALLA ON IMPROVEMENT OF RIVERS.



FIG. 1.—BLACK WARRIOR RIVER: SITE OF LOCK NO. 4, LOOKING DOWN STREAM.



FIG. 2.—BLACK WARRIOR RIVER: LOCK AND DAM NO. 1, LOOKING UP STREAM.

are still trying to do business as they did fifty years ago. Our railroads are about the most progressive institutions we have, and they have in their employ much of the very best talent in the country. They are generally up to date, and aggressively fight water competition, at a loss, if necessary, and make it up elsewhere.

Much of our water transportation is stopped by ice for 4 or 5 months annually, while the railroads offer much quicker transportation regularly throughout the year and have much better facilities for distributing freight to customers at terminals.

There are a few exceptions in which it seems almost impossible that railroads can ever compete with water transportation. Perhaps the most notable case is the coal traffic in barges from Pittsburg to New Orleans, a distance of 2 000 miles by river. Coal is said to be transported over this route at an actual cost of 50 cents per ton, or $\frac{1}{2}$ mill per ton-mile. The low cost of this traffic is due to good business management and the enormous quantities transported; 50 000 tons and more are frequently handled in a single tow from Louisville down. Probably no railroad would attempt to transport coal from Pittsburg to New Orleans for less than \$3 per ton.

The Black Warrior River and its tributaries, the Mulberry and Locust Forks, split in twain the great Warrior Coal Basin, covering an area of some 3 000 sq. miles, and containing by far the finest and greatest deposits of coal south of West Virginia. It is only 400 miles by river from the heart of this coal basin to tide water at Mobile. The best and most extensive bodies of iron ore in Alabama, also the whole Birmingham District, with its wonderful mineral developments, lie within 12 to 30 miles by rail east of these streams. The lock system, when completed, will furnish water transportation throughout the year, for ice is practically unknown in this climate.

It is believed that mines along the river can place an excellent quality of steam coal, f. o. b. barge, at a cost of about 60 cents per short ton, and that the actual cost of transportation, when the lock system is completed, should not exceed 20 cents per short ton, or $\frac{1}{2}$ mill per ton-mile, a rate with which it is probable that railroad transportation can never compete. If these conditions should be realized, not only coal, but pig iron, steel and other mineral products of the Birmingham District can be placed in Mobile more cheaply than similar products can be placed in any other port in the world. This should

result in an enormous export trade from Mobile being rapidly built up, extending not only to the West Indies, Central and South America, but to the ports of all nations.

It is realized that the exact cost of barging coal through this lock system will never be known until it is done on a large scale, and then will vary from year to year with the cost of labor, materials and incidentals; but there is no doubt that the cost will be much less than the present railroad rate of \$1.10 per ton. Besides, the improved river will open a large area of coal lands, at present without railroad facilities and utterly inaccessible. Even on the supposition that the railroads will build into this territory and handle the traffic, with an improved river ready to compete with them at all times, they would have to do it at a much lower rate than \$1.10 per ton, and the public would save the difference. In fact, one of the strongest arguments in favor of the improvement of rivers and canals by the general government is that they serve to regulate and control railroad rates more effectively than legislation ever can. Able railroad attorneys can generally find some means of evading inimical regulations framed by legislative bodies. Well-managed railroads will probably always find some way of pooling interests when it is greatly to their advantage to do so. But it is a difficult matter to pool with a public waterway, operated and maintained by the general government without tolls, because any town or individual with a few thousand dollars can build an independent boat and "break the combination."

For these reasons, the writer firmly believes that the improvement of these rivers is *pro bono publico*, and therefore worthy of being done by the general government.

PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS.
(INSTITUTED 1852.)

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Papers and Discussions.....Pages 427 to 478.

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ON UNIFORM TESTS OF CEMENT:—George S. Webster, George F. Swain, Alfred Noble, W. B. W. Howe, Louis C. Sabin, S. B. Newberry, Clifford Richardson, Richard L. Humphrey, F. H. Lewis.



The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

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AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

May 7th, 1902.—The meeting was called to order at 8.45 p. m., Frank C. Osborn, Director, Am. Soc. C. E., in the chair; Charles Warren Hunt, Secretary; and present, also, 115 members and 20 guests.

The minutes of the meetings of April 2d and 16th were approved as printed in *Proceedings* for April, 1902.

A paper by George S. Webster and Samuel Tobias Wagner, Members, Am. Soc. C. E., entitled "The Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa.," was presented by Mr. Webster, and illustrated with lantern slides.

A written discussion by Joseph M. Wilson, M. Am. Soc. C. E., was presented by the Secretary, and the paper was discussed orally by Messrs. Charles G. Darrach, William B. Parsons and George S. Webster.

Ballots for membership were canvassed, and the following candidates were elected:

AS MEMBERS.

GEORGE ANSEL CARPENTER, Pawtucket, R. I.
 CHARLES HENRY CLARK, Utica, N. Y.
 JOHN ERNST ERICSON, Chicago, Ill.
 BENJAMIN TRUMAN FENDALL, Baltimore, Md.
 HENNING FERNSTROM, New York City.
 WILLIAM CHARLES GOTSHALL, New York City.
 HERBERT THOMAS GRANTHAM, Philadelphia, Pa.
 HENRY ARTHUR HALL, Boston, Mass.
 ARTHUR STANLEY IVES, Philadelphia, Pa.
 CHARLES WILLAUER KUTZ, Washington, D. C.
 EDWIN JOHN ROSECRANS, New York City.
 LOUIS CARLTON SABIN, Port Huron, Mich.
 FRANCIS CLINTON SHENEHON, Detroit, Mich.
 GEORGE WAY SWINBURNE, Jr., New York City.
 JOHN WILLIAM WOERMAN, Sheffield, Ill.

AS ASSOCIATE MEMBERS.

HENRY ERSKINE BAKER, Watertown, N. Y.
 GEORGE ELLIOT BROWNING, Trichur, S. India.
 HARRISON PRESCOTT EDDY, Worcester, Mass.
 LOUIS AMEDEE GUERINGER, Marlin, Tex.
 ISAAC ONWARD HARPER, Baltimore, Md.
 THEODORE ELY KNOWLTON, Watertown, N. Y.
 CHARLES REAL OLBERG, Washington, D. C.
 ARCHIBALD LIVINGSTONE PARSONS, Washington, D. C.
 HAROLD TAIT, Long Island City, N. Y.
 MORRELL VROOMAN, Gloversville, New York.
 ERNEST WOODBURY WIGGIN, New Haven, Conn.
 ARTHUR JOHN WILLS, Harrisburg, Pa.
 JULIUS HERMAN GEORGE WOLF, San Francisco, Cal.

The Secretary announced the election of the following candidates by the Board of Direction on May 6th, 1902:

AS ASSOCIATES.

JOHN LAROY MANN, Hanover, N. H.
 JOHN BURTON STOUDER, Mason City, Iowa.

AS JUNIORS.

WALTER EDMOND BARNES, New York City.
 ARTHUR EMIL WENIGE, New York City.
 JOHN HOUGH WICKERSHAM, New York City.

The Secretary announced the death of the following members:

JAMES ELLISON MILLS, elected Member, Feb. 3d, 1896; died July 25th, 1901.

REGINALD McKEAN, elected Assoc. M. May 2d, 1894; died Oct. 15th, 1901.

The Secretary announced the details of the programme of the Annual Convention, and also some information relative to the special train from New York to Washington.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

May 6th, 1902.—Vice-President Schneider in the chair; Charles Warren Hunt, Secretary ; and present, also, Messrs. Briggs, Croes, Knap, Knichling, O'Rourke, Osborn and Seaman.

The President was authorized to appoint a Committee to award prizes for the year ending with the month of July, 1902.

Applications were considered and other routine business transacted.

Two candidates for Associate and three for Junior were elected.*

Adjourned.

* See page 148.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, June 4th, 1902.—8.30 p. m.—At this meeting, ballots for membership will be canvassed, and a paper by George L. Dillman, M. Am. Soc. C. E., entitled “A Proposed New Type of Masonry Dam,” will be presented for discussion.

This paper was printed in the *Proceedings* for April, 1902.

Wednesday, September 3d, 1902.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and a paper by R. C. McCalla, M. Am. Soc. C. E., entitled “Improvement of the Black Warrior, Warrior and Tombigbee Rivers, in Alabama,” will be presented for discussion.

This paper was printed in the *Proceedings* for April, 1902.

Wednesday, September 17th, 1902.—8.30 p. m.—At this meeting, a paper by James N. Hazlehurst, M. Am. Soc. C. E., entitled “The Maintenance of Asphalt Streets,” will be presented for discussion.

This paper is printed in this number of *Proceedings*.

ACCESSIONS TO THE LIBRARY.

From April 9th to May 6th, 1902.

DONATIONS.*

THE RAILWAY TRANSITION SPIRAL.

By Arthur N. Talbot, M. Am. Soc. C. E. Third Edition, Revised. Leather, 7 x 4 ins., 110 pp. New York, Engineering News Publishing Co., 1901. \$1.50.

The writer states that the treatment given in this book has been quite widely used on the railroads of the United States, and has been commended by many engineers for its simplicity, convenience and flexibility. The conceptions and methods used are similar to those of ordinary circular railroad curves. In this revision attention has been given to illustrative examples and explanations; the tables have been extended and a treatment of the uniform chord length method and of street railway spirals has been added. The Contents are: Nomenclature; Theory; Summary of Principles; Description and Use of the Tables; Choice of n and Length of Spiral; Location of P. S., P. C. C., and P. C.; Laying Out of the Spiral by Co-ordinates; Location by Transit and Deflection Angles; Application to Existing Curves; Compound Curves; Miscellaneous Problems; Uniform Chord Length Method; Street Railway Spirals; Explanation of Tables; Tables.

LOGARITHMIC TABLES OF THE MEASURES OF LENGTH.

Extending from 0 to 50 Feet at Intervals of One-Sixteenth of an Inch. By Thos. W. Marshall. Leather, 3 x 6 ins., 106 pp. New York, The Engineering News Publishing Company, 1902. \$2.00.

It is stated in the preface that all the tables have been carefully checked several times—both before and after they were set in type—and it is believed that all errors of greater magnitude than one unit in the last decimal place have been eliminated.

A TEXT-BOOK ON ROOFS AND BRIDGES.

Part III. Bridge Design. By Mansfield Merriman and Henry S. Jacoby. Fourth Edition, Rewritten. Cloth, 9 x 6 ins., 8 + 374 pp., plates, illus. New York, John Wiley & Sons, 1902. \$2.50.

This edition has been entirely rewritten in order to bring the subject fully up to date. In so doing, it has been the constant aim of the authors, not only to give the latest details of modern bridge practice, but also to set forth the reasons for such practice in a manner especially adapted to the needs of students and young engineers. The preface states that in the descriptions of the details of plate-girder and truss bridges only those are given which may be properly claimed as standard in the best recent practice. A new feature of the book consists in lists of references to engineering periodicals where more extended descriptions and applications of various details may be found. The Contents are: History and Literature; Principles of Economic Design; Bridge Contracts and Office Work; Bridge Shops and Shop Practice; Tables and Standards; Details of Plate-Girder Bridges; Design of a Plate-Girder Bridge; Details of Railroad Pin Bridges; Design of a Pin Truss Bridge; Design and Detailing of a Highway Bridge; Railroad Riveted Bridges. There is an index of four pages.

IRRIGATION IN THE UNITED STATES.

By Frederick Haynes Newell, M. Am. Soc. C. E. Cloth, 8 x 5 ins., 19 + 417 pp., 62 plates, illus. New York, Thomas Y. Crowell & Co., 1902. \$2.00. (Donated by the Author.)

The writer has been continuously engaged for the past twelve years in conducting investigations of the extent to which the arid regions can be reclaimed by irrigation; ascertaining the cost and capacity of reservoirs, measuring the flow of rivers useful for power, irrigation, and other industrial purposes, and mapping the artesian or underground waters. The attempt is here made to bring together, in as non-technical a manner as possible, the results of this study and experience. A somewhat elementary and popular description of irrigation and of the devices for obtaining and distributing water is given, more space being devoted to the crude, but effective, home-made contrivances than to the elaborate and expensive machinery purchased from manufacturers. The chapter headings are: Reclamation of the Public Lands; The Arid Regions;

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

Surface Waters; Conveying and Dividing Stream Waters; Reservoirs; Methods of Irrigation; Underground Waters; Pumping Water; Advantages and Disadvantages of Irrigation; Irrigation Law; States and Territories of the Arid Regions; States of the Semi-Arid Region; Humid Regions; Conclusion. There is an index of eleven pages.

DIE NATÜRLICHEN NORMALPROFILE DER FLEISSENDEN GEWÄSSER.

Vortrag gehalten in der Vollversammlung des Oesterr. Ingenieur- und Architekten-Vereines am 25. Jänner 1902 von Richard Siedek. Paper, 9 x 6 ins., 21 pp., illus. Wien, Wilhelm Braumüller, 1902.

THE LAW OF CONTRACTS.

A Text-Book for Technical Schools of Engineering and Architecture. By John Cassan Wait, M. Am. Soc. C. E. Cloth, 9 x 6 ins., 14 + 331 pp. New York, John Wiley & Sons, 1901. \$3.00. (Donated by the Author.)

The chapters here presented are the substance of a course of lectures delivered by the author some years ago before the technical classes in engineering and architecture at Harvard University. They were first embodied in his book on "Engineering and Architectural Jurisprudence," but, as that work is more comprehensive than is required for a textbook, this abridged edition has been issued. The preface states that the present volume contains the essential principles upon which valid contracts depend, and the main features of the statutes which modify and limit the obligations of contracts, and also, in a fairly complete and concise form, the law of bidding and letting. Almost all the illustrations used and the cases cited as authorities are those which have arisen in engineering and architectural work. The Contents are: Essential Elements of a Contract; Legal and Illegal Contracts; The Parties to a Contract; Law of Contracts; Essential Elements of a Contract; General Statutes Limiting the Law of Contracts; The Rights and Liabilities of Bidders for Public Work; Bids and Bidders; Work for Private Parties; Employment or Engagement of Engineer or Architect; Property of Engineers or Architects in Designs or Inventions; Liability of Engineer or Architect as a Professional Man; Liability of Engineer or Architect when his Functions are Judicial or Discretionary; Liability of an Engineer or Architect when a Public Officer; Compensation of Engineers and Architects; Employment of an Engineer or Architect as an Expert Witness. There is an index of twenty-seven pages.

A TREATISE ON THE PRESERVATION OF METAL.

A Practical, Comprehensive Hand-Book for Architects, Builders, Mechanical and Civil Engineers, Painters, Metal Workers, Property Owners, and Anyone Supervising the Maintenance of Steel and Iron Structures. By Lionel M. Stern. Paper, 8 x 5 ins., 21 pp. Central Printing and Publishing House, Harrisburg, Pa., 1901. 50 cents. (Donated by the Author.)

The following gifts have also been received:

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A Handbook for the Electrical Laboratory and Testing Room. By J. A. Fleming, M. Inst. E. E. Volume I. New York, The D. Van Nostrand Company; London, "The Electrician" Printing and Publishing Company, Limited, 1901.

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Mitteilungen über Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, insbesondere aus den Laboratorien der technischen Hochschulen, herausgegeben vom Verein deutscher Ingenieure. 3 vol. Berlin, Julius Springer, 1901.

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Sanitary Engineering of Buildings. By Wm. Paul Gerhard, M. Am. Inst. Archts. Vol. 1. New York, William T. Comstock, 1899.

A Dictionary of Architecture and Building, Biographical, Historical, and Descriptive. By Russell Sturgis, M. Am. Inst. Archts., and Many Architects, Painters, Engineers, and Other Expert Writers, American and Foreign. 3 vol. New York, The Macmillan Company; London, Macmillan & Co., Ltd., 1901.

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- Cement and Engineering News** (to complete set). 7 vol., 20 nos.
- Electrical Engineer** (to complete set). 5 vol.
- Electrical World and Engineer** (to complete set). 11 vol.
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McKEAN, REGINALD.	Elected Associate Member May 2d, 1894; died October, 1901.
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(April 9th to May 6th, 1902.)

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- (33) *Le Génie Civil*, Paris, France.
- (34) *Portefeuille Économique des Machines*, Paris, France.
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 Defective Bridge Construction in the Prairie States.* Daniel B. Luten. (13) Apr. 17.
 The Painting and Sand-Blast Cleaning of Steel Bridges and Viaducts. George W. Lilly, Assoc. M. Am. Soc. C. E. (Paper read before the Engineers' Club of Columbus, O.) (13) Apr. 24.
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 The Phase Displacement of Alternators and Parallel Running. H. G. Leake. (26) Serial beginning April 4.
 Tests on the Nernst Lamp. R. P. Hulse. (Paper read before the Birmingham Section, Inst. Elec. Engrs.) (47) Apr. 5.
 Electric Wiring Methods of To-day, with Particular Reference to Conduit Systems. Fred. Bathurst, A. M. I. E. E. (26) Apr. 11.
 Grounding of High Potential Systems.* J. D. Nies. (27) Apr. 12.
 The Storage Battery in the Commercial Operation of Electric Automobiles.* W. H. Palmer, Jr. (27) Apr. 12.
 Air-Spaced Cables: Their Treatment and Use. G. E. Fletcher, Assoc. M. Inst. C. E. (Paper read before Inst. Elec. Engrs.) (47) Apr. 19.
 Ratio of Transformation in Three-Phase Circuits. Wm. A. Del Mar. (27) Apr. 19.
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 Dispositif Protecteur pour les Installations Électriques à Lignes Aériennes parcourues par des Courants de Haute Tension. MM. Krizick et Fischer-Hinnen. (43) 4^e Trimestre, 1901.
 La Fabrication des Charbons Électriques. (34) Apr.
 Usine Hydro-Électrique de Hagney (Suisse).* Henry Martin. (33) April 12.

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- Torsional Vibration of Shafts. L. Gümbel. (Paper read before the Inst. of Naval Archts.) (11) Apr. 11.
 The Navipendular Method as applied to some Warships of Different Classes. G. Russo. (Paper read before Inst. of Naval Archts.) (11) Serial beginning April 18.
 On the Corrosion of Condenser Tubes and Sea-Water Conductors.* Ernst Cohen. (Paper read before the Inst. of Naval Archts.) (11) Apr. 25.

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 Parallel Operation of Engine-Driven Alternators. W. L. R. Emmett. (42) Mar.
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 Circulation in Water-Tube Boilers. Wm. H. Booth. (26) Apr. 4.
 Distortion in Boilers Due to Overheating. C. E. Stromeyer. (11) Apr. 4; (12) Apr. 4.
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- Evolution of the Shaft Governor. R. C. Carpenter. (Paper read before the Engine Builders' Assoc.) (47) Serial beginning Apr. 5.
- Boiler Scale Solvents. (62) Apr. 10.
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- The Distribution of Artificial Gas under High Pressure. (14) Apr. 12.
- The Mechanical and Heating Apparatus in the New Century Apartment House, New York.* (14) Apr. 12.
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- Wheel Gearing.* W. H. Thornberry. (22) Serial beginning Apr. 18.
- Circulation in Water-Tube Boilers. A. C. Elliott. (11) Apr. 18.
- Some Notes on Steam Turbines.* F. J. Warburton. (10) Apr. 19.
- High Speed for Shafting and Beiting. Charles A. Hague, M. Am. Soc. C. E. (14) Apr. 19.
- Distortion in Boilers Due to Overheating. C. E. Stromeyer. (Paper read before the Inst. of Naval Archts.) (47) Serial beginning Apr. 19.
- The Mechanical Plant of the Broad Exchange Building, New York.* (14) Apr. 19.
- Oil Gas and Oil Incandescent Lighting. Vivian B. Lewes. (66) Apr. 23.
- The Cockerill Variable Cut-Off Gear for Gas Engines.* (20) Apr. 24.
- Motor Car Exhibition at Islington.* (12) Serial beginning Apr. 25.
- New Cranes in German Dockyards.* (12) Apr. 25.
- Guarding Machine Tools.* W. H. Johnson. (Paper read before the Inst. of Mech. Engrs.) (11) Apr. 25.
- Standardization of Pipe Flanges and Flanged Fittings.* Robert E. Atkinson. (Paper read before the Inst. of Mech. Engrs.) (11) Serial beginning Apr. 25.
- The Wigzell Balanced Engine.* R. J. Isaacson. (47) Apr. 26.
- An American Poppet-Valve Engine.* (64) May.
- The Fuel Value of Residuals. Charles F. Prichard. (Paper presented to the Amer Gas Light Assoc.) (64) May.
- The Operation of the Modern Grain Elevator.* Day Allen Willey. (9) May.
- Gas-Power Plants for Mining and Smelting.* Hawley Pettibone. (10) May.
- The Allerger Cooling Towers.* (20) May 1.
- New Airship under Construction for the British War Office.* (46) May 3.
- The Mechanical Plant in the University Club, New York City.* (14) May 3.
- The Oxford Paper Mills.* (14) May 3.
- Les Charbons Américains en France. A. de Geunes. (32) Feb.
- Les Appareils de Sûreté des Chaudières à Vapeur: Soupapes de Sûreté. F. Sinigaglia. (37) Mar.
- Transporteur Aérien sur Cables de l'Usine Hydro-électrique de Vouvry (Suisse).* Alfred Boudon. (33) Mar. 29.
- Basculeur Automatique, Système Malissard-Taza, Installé aux Mines de Marles, pour l'Embarquement Mécanique des Charbons.* (34) Apr.
- Machines à Percer Radiales Américaines Fosdick & Holloway.* (36) Apr. 10.
- Étude sur Pompe Sèche. E. Portemont. (36) Apr. 10.
- Théorie de la Vapeur Surchauffée. Loffet. (36) Serial beginning Apr. 10.

Metallurgical.

- Upon the Constitution of Binary Alloys. John Alexander Mathews. (3) Serial beginning Jan., ending Mar.
- An Improved Method of Supplying Water to Blast Furnace Tuyeres and Coolers.* W. J. Foster. (22) Apr. 11.
- An Automatic System of Sampling.* Paul Johnson. (16) Apr. 12.
- The Rader Blast Furnace.* (62) Apr. 17.
- The False Witness of the Test Bar. Robert Buchanan. (9) May.
- The Fc undry Cupola and How To Manage It. Robert Buchanan. (10) May.
- Low-Grade Iron Ores for the Smelting Furnace, Concentrating and Briquetting. Thomas Benjamin Grierson. (10) May.
- Les Convertisseurs pour Cuivre. P. Jannettaz. (32) Feb.
- Hauts Fourneaux d'Eliza, a Pittsburg (États-Unis).* Aug. Dutreux. (33) Apr. 5.

Military.

- Are Disappearing Guns Essential to the Efficient Defense of Our Seaports?* Edwin R. Stuart and W. R. Hamilton. (44) Mar.
- Reconstruction des Formes de Radoub de Pontaniou dans l'Arsenal de Brest. G. Richou. (32) Feb.

Mining.

- What is the Least Possible Waste in Working Coal? James Barrowman. (50) XXIII, Part 3.

Mining—Continued.

- The Use of Compressed Air in Mining. T. W. Barber, M. I. C. E. (22) Apr. 4.
 Driving the Newhouse Tunnel.* H. Foster Bain. (16) Apr. 19.
 The Divergence of Long Plumb Lines at the Tamarack Mine.* F. W. McNair. (16) Apr. 26.

Miscellaneous.

- The National Bureau of Standards. S. W. Stratton. (2) Apr.
 A Report on the Metric System. (20) Apr. 17.

Municipal.

- An Exhibit of Municipal Ownership in the United States. (13) Apr. 10.
 Improvements in Tests of Macadam Materials. (14) Apr. 19.
 Comparison of Brick Tests and Street Wear. Charles Carroll Brown, M. Am. Soc. C. E. (60) May.

Railroad.

- Some Principles of Railway Regulation. H. T. Newcomb. (65) Mar.
 The Value of Up-to-date Tools for Railroad Work. M. K. Barnum. (61) Mar.
 Western Railway Club: Report of the Committee on Revision of the Rules of Inter-change. (61) Mar.
 The Transition Spiral. Wm. M. Torrance. (4) Apr.
 British, Belgian and American Locomotives in Egypt. (12) Serial beginning Apr. 4.
 Railroad Organization. Arthur Hale. (15) Apr. 11.
 American Locomotive Construction.* (12) Serial beginning Apr. 11.
 Tandem Compound Locomotive for Chicago Great Western.* (40) Apr. 11.
 The Collinwood Shops of the Lake Shore.* (40) Apr. 11.
 The Aspen Tunnel.* (16) Apr. 12.
 Vancleave Four-Cylinder Balanced Compound Locomotive.* (47) Apr. 12.
 A Locomotive for Burning Lignite Fuel. (13) Apr. 17.
 Suggestion for a More Uniform Practice in Fixing the Lengths of Spiral Curves. W. D. Taylor, M. Am. Soc. C. E. (13) Apr. 17.
 Microscopic Observations on Deterioration in Steel Rails.* Thomas Andrews. (11) Apr. 18.
 A Four-Cylinder Compound for Fast Trains.* (15) April 18.
 Forty-ton Steel Frame Box Car, Norfolk & Western Railway.* (15) Apr. 18.
 The McCann Spreader Car.* (18) Apr. 19.
 The Hurley Track-Laying Machine.* L. A. Wells. (13) Apr. 24.
 New Types of Freight Locomotives on the Atchison, Topeka & Santa Fe and Northern Pacific Rys.* (13) Apr. 24.
 Railroad Water Supply.* William Archer. (40) Apr. 25.
 Track Elevation in Newark, New Jersey. Clarence H. Baily. (15) Apr. 25.
 The Atlantic Avenue Improvements of the Long Island Railroad.* (15) Apr. 25.
 Consolidation Freight Locomotive—Norfolk & Western Railway.* (15) April 25.
 Daly's Train-Resistance Computer.* (15) Apr. 25.
 Improved Devices for Refrigerator Cars.* (18) Apr. 26.
 Elasticity in Draft Gear. R. A. Parke. (Paper read before the Ry. Club of Pittsburg.) (18) Apr. 26.
 The "Handy" Men of the Railway: A Study of British Tank Locomotives.* J. F. Gairns. (10) May.
 New Shops at Du Bois, Pennsylvania.* (25) May.
 Graphical Method of Determining Stresses in Car Framing. J. H. Lonie. (25) May.
 The Colorado Springs & Cripple Creek District Railway.* W. P. Hardesty. (13) May 1.
 The Burlington Route Test Car.* (15) May 2; (18) May 3.
 Train Resistance. W. J. Davis, Jr. (17) May 3.
 Note sur les Machines Compound à 4 Cylindres et 8 Roues Accouplées de la Compagnie des Chemins de Fer du Midi. (38) Apr.
 La Traction Électrique sur la Ligne du Fayet à Chamonix. M. Auvert. (38) Apr.
 Locomotives Chauffées au Naphte et au Goudron.* F. Barbier. (33) Apr. 19.

Railroad, Street.

- Problems of Electric Railways. J. Swinburne and W. R. Cooper. (Paper read before the Inst. of Elec. Engrs.) (47) Serial beginning Apr. 5.
 The Brooklyn Bridge Railroads.* Julius Meyer. (15) Apr. 18.
 Tube Railways and Vibration. (12) Apr. 18.
 The Paris Metropolitan Railway. C. H. Wordingham, M. Inst. C. E. (26) Apr. 25.
 The Berlin Elevated and Underground Railroad.* (14) Apr. 26.
 The Berlin Overhead and Underground Electric Railway.* (26) Serial beginning Apr. 26.
 The Sanitary Condition of Street Cars in New York. George A. Soper. (19) May 3.
 The Street Railway System of Syracuse, N. Y.* (17) May 3.
 New Repair Shops at Providence.* (17) May 3.
 Houghton County Street Railway.* W. R. Parker. (17) May 3.
 New Transportation System for Newcastle-on-Tyne.* (17) May 3.
 Tramways à la Prise de Courant par Contacts Superficiels de la Lorain Steel Co.* (33) Mar. 29.

Sanitary.

- Sewage Purification Plants. John W. Alvord. (4) Apr.
 The New Sewage Disposal Works at Gardner, Mass.* (14) Apr. 12.
 Proposed Light Refuse Crematory for New York City.* (13) Apr. 17; (14) Apr. 19.
 The New Sewage Disposal Works at Pittsfield, Mass.* (13) Apr. 24.
 A British Refuse Lighting Plant.* (27) Apr. 26.
 Central Station Heating. D. F. McGee. (Paper read before the Iowa State Electric
 Light Assoc.) (60) May.

Sewage Disposal at Fond du Lac, Wisconsin.* Irvine Watson. (60) May.
 Details of New York School Plumbing.* (14) May 3.
 Sewage Disposal at Collingswood, N. J.* G. Everett Hill. (14) May 3.

Structural.

- Masonry. (Report to the Amer. Ry. Eng. and M. of W. Assoc.) (14) Apr. 12; (15) Apr.
 11.
 The Construction of the Hanover Bank Building, New York.* (14) Apr. 12.
 A Successful Test of Concrete-Steel Factory Construction. (14) Apr. 12.
 The Substructure Work for the Mutual Life Building, New York.* (14) Serial beginning
 Apr. 19.
 Lifting and Underpinning a Nine-Story Wall. (14) Apr. 19.
 The Chemistry of the Protection of Steel against Rust and Fire by Concrete. (13) Apr.
 24.
 The Modern Tall Steel Building: Corrosion and Fire Dangers. William Sooy Smith. (10)
 May.
 A Foundation Failure and Its Reconstruction.* (13) May 1.
 Contribution à l'Étude de la Déformation Élastique des Solides. A. Mesnager. (43) 4^e
 Trimestre, 1901.

Water Supply.

- The Determination of the Efficiency of Hydraulic Rams. A. J. Wood. (8) Apr.
 Mechanical Filtration. Robert E. Milligan. (4) Apr.
 A Small Water Power Electric Transmission Plant for Local Lighting Service, Utah
 County, Utah.* W. P. Hardesty. (15) Apr. 17.
 Notes on Lost Head in Water Supply Systems. A. Prescott Folwell, M. Am. Soc. C. E.
 (13) Apr. 17.
 The Joliet Water-Power Plant on the Chicago Drainage Canal.* (14) Apr. 19.
 Artesian Water Supply and Irrigation. W. Gibbons Cox. (12) Serial beginning Apr.
 25.
 The Estimation of Damages to Power Plants from Back-Water. (14) Apr. 26.
 The Kennicott Water Softener.* (14) May 3.
 Pompe Centrifuge Schalaver pour Élevation d'Eau à Grande Hauteur.* Gérard
 Lavergne. (33) Apr. 19.

Waterways.

- Notes Collected in Relation to Docks and Harbors in Great Britain, France and Belgium
 in the Summer of 1900.* Frank W. Hodgdon. (1) Mar.
 Breakwaters and Plans for Breakwater Extension at Agate Bay, Two Harbors, Minn.*
 S. M. White. (1) Mar.
 The Improvement of the Channels of the Delaware and Schuylkill Rivers by the City of
 Philadelphia.* C. H. Ott. (2) Apr.
 General Discussion on the Discharge of Streams. (2) Apr.
 Indicating and Recording the Tides.* Day Allen Willey. (46) Apr. 12.
 Some Needed Reforms in the Conduct of River and Harbor Work. (13) Apr. 17.
 Plans for the Protection of Galveston from Floods.* (13) Apr. 24.
 The Improvement of the Erie Canal.* (46) Apr. 26.
 Bacterial Purification of Sewage. Dr. B. H. Buxton. (Extracts from paper in the *Philadelphia Medical Journal*.) (14) Apr. 26.
 Progrès les Plus Récents de l'Éclairage et du Balisage des Côtes.* M. Ribière. (43) 4^e
 Trimestre, 1901.
 Addition de Pouzzolanes aux Ciments Portland dans les Travaux Maritimes. R. Feret.
 (43) 4^e Trimestre, 1901.
 Application d'un Cabestan Électrique à la Traction des Bateaux.* M. Mazoyer. (43)
 4^e Trimestre, 1901.

* Illustrated.

PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS.

(INSTITUTED 1852.)

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The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

HOUSE OF THE SOCIETY — 220 WEST FIFTY-SEVENTH STREET, NEW YORK.

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AMERICAN SOCIETY OF CIVIL ENGINEERS,

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

THIRTY-FOURTH ANNUAL CONVENTION, HELD AT WASHINGTON, D. C., MAY 20th, 21st, 22d and 23d, 1902.

Opening Session, Tuesday, May 20th, 1902.—The meeting was called to order at 10 A. M. by Mordecai T. Endicott, M. Am. Soc. C. E., Chairman of the Committee of the Board of Direction on the Annual Convention.

The Chairman introduced the Hon. H. B. F. Macfarland, President of the Board of Commissioners of the District of Columbia, who, in a brief speech, welcomed the Society to the national capital. The Chairman then introduced Rear Admiral George W. Melville, Hon. M.

Am. Soc. C. E., Chairman of the Local Committee of Arrangements, who, in behalf of the local members, extended a hearty welcome to the Members of the Society and their guests.

The President, Robert Moore, M. Am. Soc. C. E., then took the chair, and introduced Chas. Warren Hunt, Secretary, Am. Soc. C. E., who presented a sketch of the history of the Society during its first fifty years.

General William P. Craighill, Past-President, Am. Soc. C. E., moved that a telegram of congratulation be sent to Mr. Robert B. Gorsuch, the first Secretary of the Society, and who, according to Mr. Hunt's report, is the only survivor of those who founded the Society in 1852. The motion, duly seconded, was carried unanimously.

The following message was sent:

" WASHINGTON, D. C.,
" May 20th, 1902.

" ROBERT B. GORSUCH,
" Mexico City.

" The American Society of Civil Engineers, by unanimous vote in Annual Convention, tenders kind greetings and good wishes to Robert B. Gorsuch, the sole survivor of its founders.

" CHAS. WARREN HUNT,
" Secretary."

Subsequently, this reply was received:

" MEXICO CITY,
" May 21, 1902.

" CHAS. WARREN HUNT,
" Secy., *American Society of Civil Engineers*,
" Washington, D. C.

" Your kind greetings on behalf of the Society of which I had the honor of being one of its founders brings overwhelming recollections of ambitious effort now a pleasure tempered with sadness. Proud of having been one of the initiators of so eminent a scientific society, please tender my highest appreciation to its members for their thoughtfulness on the occasion mentioned.

" R. B. GORSUCH."*

The President then delivered the Annual Address.

The Secretary presented letters from the Director, U. S. Geological Survey, offering facilities for the inspection of Methods of Survey, etc., and transmitting 500 copies of the Topographic Map of Washington and Vicinity; from the President of the Capital Traction Company, tendering free transportation during the four Convention days; from the Commandant, Washington Navy Yard, stating that he had arranged to put a jacket on a 12-in. gun during the visit of the Society to the Yard on the 21st; from the Secretary of the Navy, acknowledging an invitation to attend the Convention; from the Secretary of the International Association for Testing Materials, inviting Members to attend the Fifth

*These messages are here interpolated to preserve the record in convenient form.

Annual Meeting of the American Section, June 12th-14th, 1902; and from the Secretary of the Cosmos Club, extending the courtesies of the Club to members of the Society during the Convention.

A resolution, introduced by Bernard R. Green, M. Am. Soc. C. E., inviting the local officers of the Corps of Engineers of the Army and Navy, Civil Engineers of Washington, not members of the Society, and the Washington Chapter of the American Institute of Architects, to attend the meetings of the Convention was seconded and carried unanimously.

David S. Carll, M. Am. Soc. C. E., explained the arrangements which had been made in reference to free transportation over the lines of the Washington Railway and Electric Company during the Convention, and in reference to the excursion to Cabin John Bridge.

Colonel William M. Black, M. Am. Soc. C. E., extended an invitation to visit Washington Barracks and witness the guard mounting and dress parade of the Engineers' School and Battalion, and announced further details in reference to the excursion to Fort Washington, Marshall Hall and Mt. Vernon on Thursday, May 22d.

Adjourned.

Second Session, Tuesday, May 20th, 1902.—The meeting was called to order at 8 p. m.; the President, Robert Moore, in the chair; Chas. Warren Hunt, Secretary; many members and guests being present.

Talks, descriptive of engineering works in Washington, and illustrated with lantern slides, were given, as follows:

On District Government, by Colonel William M. Black, M. Am. Soc. C. E.

On the Washington Sewers, by D. E. McComb, M. Am. Soc. C. E.

On the Water Supply of Washington, by Colonel A. M. Miller, M. Am. Soc. C. E.

On the Washington Monument and Library of Congress, by Bernard R. Green, M. Am. Soc. C. E.

On the Electric Railways of the District, by D. S. Carll, M. Am. Soc. C. E.

On Proposed Park Improvements in the District, by Charles Moore, Esq.

Adjourned.

BUSINESS MEETING.

Third Session, Wednesday, May 21st, 1902.—The meeting was called to order at 10.30 a. m.; President Robert Moore in the chair; Chas. Warren Hunt, Secretary.

The Secretary presented the report of the Committee on the

desirability of action being taken for the protection of engineers and the public from incompetent practitioners.*

On motion, duly seconded, the report was accepted and adopted.

H. G. Prout, M. Am. Soc. C. E., presented the report of the Committee on a Proposed Amendment to the Constitution Relative to Admission to Membership.†

On motion, duly seconded, the report was received and placed on file.

William P. Craighill, Past-President, Am. Soc. C. E., presented the following resolution:

“*Resolved*, That the Board of Direction be requested to frame an amendment to the Constitution which shall do away with the secret letter-ballot now used in the election of corporate members, and substitute therefor an open or signed ballot.”

The resolution was duly seconded, and, after discussion, was withdrawn by the proposer.

The Secretary presented a report of the votes received as to the Time and Place for holding the Annual Convention of 1903;‡

After discussion, it was moved that:

“The matter of the time and place for the Annual Convention of 1903 be referred to the Board of Direction, with the statement that it is the sense of this meeting that it shall be held in Asheville, N. C.”

The motion, being duly seconded, was carried.

The Secretary reported a recommendation from the Board of Direction that the Special Committee “On Analysis of Iron and Steel,” Subcommittee of the American Society of Civil Engineers (of the International Committee on Standards for the Analysis of Iron and Steel, of which Professor J. W. Langley is chairman), be discharged.

On motion, duly seconded, the Committee was discharged.

The Secretary reported that the Board of Direction recommends that the Special Committee “On Units of Measurement” be discharged.

On motion, duly seconded, the Committee was discharged.

Adjourned.

Fourth Session, Wednesday, May 21st, 1902.—The meeting was called to order at 8 p. m.; President Robert Moore in the chair; Chas. Warren Hunt, Secretary.

Discussion on the following topic was called for by the President:

“In contract work, either public or private, is it preferable to make separate contracts for the different branches of trades involved, or to combine all under one general contract?”

* See page 188.

† See page 197.

‡ See page 208.

The discussion was opened by George E. Gifford, M. Am. Soc. C. E., and was continued by the following:

T. CHALKLEY HATTON, M. Am. Soc. C. E.
CHARLES G. DARRACH, M. Am. Soc. C. E.
S. BENT RUSSELL, M. Am. Soc. C. E.
M. WARD EASBY, M. Am. Soc. C. E.
CHARLES WORTHINGTON, M. Am. Soc. C. E.
HORACE ANDREWS, M. Am. Soc. C. E.

The meeting then took up the discussion of the second topic, as follows:

"Is it possible and desirable to keep accounts of work in progress in such a manner as to ascertain unit costs on each class of work?"

The Secretary presented the opening discussion, prepared by S. Whinery, M. Am. Soc. C. E., and the subject was further discussed by the following:

CHARLES S. CHURCHILL, M. Am. Soc. C. E.
T. CHALKLEY HATTON, M. Am. Soc. C. E.
OBERLIN SMITH, M. Am. Soc. C. E.
CHARLES WORTHINGTON, M. Am. Soc. C. E.
FOSTER CROWELL, M. Am. Soc. C. E.

The meeting then took up the discussion of the third topic, as follows:

"Is steel susceptible of being made as permanent a building material as masonry?"

The discussion was opened by Charles G. Darrach, M. Am. Soc. C. E., and was continued by the following:

E. W. STERN, M. Am. Soc. C. E.
GEORGE F. SWAIN, M. Am. Soc. C. E.
C. C. WENTWORTH, M. Am. Soc. C. E.
OBERLIN SMITH, M. Am. Soc. C. E.
WILLIAM R. WEBSTER, M. Am. Soc. C. E.
CHARLES G. DARRACH, M. Am. Soc. C. E.
JAMES OWEN, M. Am. Soc. C. E.
E. T. D. MYERS, Jr., M. Am. Soc. C. E.
JOHN F. O'ROURKE, M. Am. Soc. C. E.
W. HILDENBRAND, M. Am. Soc. C. E.
H. S. HAINES, M. Am. Soc. C. E.
A. L. JOHNSON, M. Am. Soc. C. E.

The Secretary read a telegram from Mr. Robert B. Gorsuch, in reply to the message of good wishes sent to him during the First Session of the Convention.*

Adjourned.

* For text of messages exchanged, see page 170.

Fifth Session, Thursday, May 22d, 1902.—The meeting was called to order at 8 p. m.; President Robert Moore in the chair; Chas. Warren Hunt, Secretary.

The President called for discussion on the fourth topic, as follows:

"In view of the numerous disasters caused by the contracting of channels, or the damming of small streams, should non-navigable streams be under the control of the National Government?"

The discussion was opened by Rudolph Hering, M. Am. Soc. C. E., and was continued by the following:

L. M. HAUPt, M. Am. Soc. C. E.

A. M. MILLER, M. Am. Soc. C. E.

The meeting then took up the discussion of the fifth topic, as follows:

"Should the National Government undertake the construction and operation of irrigation works?"

Elwood Mead, M. Am. Soc. C. E., opened the discussion, which was continued by the following:

T. M. RIPLEY, Assoc. M. Am. Soc. C. E.

F. H. NEWELL, M. Am. Soc. C. E.

GEORGE H. MAXWELL, Esq.

J. JAMES R. CROES, Past-President, Am. Soc. C. E.

L. M. HAUPt, M. Am. Soc. C. E.

The meeting then took up the discussion of the sixth topic, as follows:

"Should Engineering Practice be regulated by a code of ethics? If so, how can such a code be established?"

George A. Soper, Assoc. M. Am. Soc. C. E., opened the discussion. Adjourned.

Sixth Session, Friday, May 23d, 1902.—The meeting was called to order at 10 a. m., President Robert Moore in the chair; Chas. Warren Hunt, Secretary.

The discussion on the sixth topic was continued by the following:

JOHN A. OCKERSON, M. Am. Soc. C. E.

BENJAMIN M. HARROD, Past-President, Am. Soc. C. E.

J. JAMES R. CROES, Past-President, Am. Soc. C. E.

F. W. DALRYMPLE, Assoc. M. Am. Soc. C. E.

GEORGE A. SOPER, Assoc. M. Am. Soc. C. E.

Written discussions on this subject by Charles G. Darrach, M. Am. Soc. C. E., and by W. Hildenbrand, M. Am. Soc. C. E., were also presented.

Chas. Warren Hunt, M. Am. Soc. C. E., presented the following resolution:

"*Resolved*, That the hearty thanks of the Society are hereby tendered to the Local Committee for the great care with which the arrangements for the comfort and pleasure of members and guests have been planned, and the masterly manner in which those plans have been carried out."

The resolution, being duly seconded, was carried unanimously.

A. Mordecai, M. Am. Soc. C. E., moved that the Board of Directors be requested to have a tree planted at Mt. Vernon, or make some suitable commemoration of the visit of the Society.

The motion, duly seconded, was carried.

Bernard R. Green, M. Am. Soc. C. E., moved as follows:

"That the thanks of the Society be extended for the courtesies received from the various organizations and departments here in Washington during this Convention: To the Secretary of War, for the courtesies at Fort Washington and the Washington Barracks; to the Secretary of the Navy, for the courtesies at the Navy Yard; to Dr. Wolcott, of the Geological Survey, for the maps freely given to the Society; to the Capital Traction Company for the free transportation upon its lines during the Convention to all the members and guests of the Convention; to the Washington Railway and Electric Company for the free cars on the occasion of the visit to Cabin John Bridge; and to the Trustees of the Corcoran Gallery of Art for the free use of the Gallery and the courtesy of their invitation to the Society to meet the friends of the Society in Washington at the gallery this evening."

The motion, duly seconded, was carried unanimously.

Adjourned.

June 4th, 1902.—The meeting was called to order at 8.45 p. m.; Emil Kuichling, Director, Am. Soc. C. E., in the chair; Chas. Warren Hunt, Secretary; and present, also, 80 members and 13 guests.

The minutes of the meeting of May 7th were approved as printed in *Proceedings* for May, 1902.

A paper by George L. Dillman, M. Am. Soc. C. E., entitled "A Proposed New Type of Masonry Dam," was presented by the Secretary, who also presented a written discussion by H. de B. Parsons, M. Am. Soc. C. E. The paper was discussed orally by Messrs. Edward Wegmann, Robert Cartwright, George H. Pegram, A. V. Abbott, J. Breuchaud, W. B. Fuller and Emil Kuichling.

Ballots for membership were canvassed, and the following candidates were elected.

AS MEMBERS.

CHARLES HINCKLEY BAKER, Seattle, Wash.

FREDERIC ADRIAN DELANO, Chicago, Ill.

JAMES ALBERT EMERY, Birmingham, Ala.

XANTHUS HENRY GOODNOUGH, Boston, Mass.

STEPHEN HARRIS, Philadelphia, Pa.

JULIUS MERRIAM HOWELLS, Los Angeles, Cal.
OWEN LOVEJOY INGALLS, Washington, D. C.
JEREMIAH JOSEPH KENNEDY, New York City.
LUTHER YAGER KERR, Greenville, Miss.
ANSON BURLINGAME McGREW, Beaver, Pa.
CLARENCE RUFUS NEHER, Buffalo, N. Y.
MICHAEL MAURICE O'SHAUGHNESSY, San Francisco, Cal.
AUGUSTUS SMITH, New York City.
OTTO HILGARD TITTMANN, Washington, D. C.
EDWARD CHANDLER TOLLINGER, Greenville, Miss.
THOMAS HENRY TUTWILER, Birmingham, Ala.

AS ASSOCIATE MEMBERS.

JOHN EDWIN BANKS, Pittsburg, Pa.
LOUIS EDWARD BOGEN, Cincinnati, Ohio.
ALFRED ELLSWORTH CARTER, Havana, Cuba.
CLARKE PELEG COLLINS, Johnstown, Pa.
JAMES RHEA FAIN, Philadelphia, Pa.
SUMNER GOWEN, Phoenixville, Pa.
WILLIAM KENDRICK HATT, Lafayette, Ind.
WILLIAM HERBERT HYDE, Pittsburg, Pa.
CHARLES HAMILTON MITCHELL, Niagara Falls, Ont., Canada.
FREDERICK CHARLES NOBLE, New York City.
THOMAS DORSEY PITTS, New York City.
CHARLES ARNER RUGGLES, New York City.
JOHN KIMBALL SCAMMELL, St. John, N. B., Canada.
WILLIAM SEATON, Jr., Rosebank, N. Y.
CHARLES MILTON SPOFFORD, Boston, Mass.
ARTHUR WEBSTER THOMPSON, Cumberland, Md.
FREDERICK EUGENE TURNERAURE, Madison, Wis.

The Secretary announced the election of the following candidates by the Board of Direction on June 3d, 1902.

AS MEMBER.

ARNOLD HENRY SUTERMEISTER, Albany, N. Y.

AS ASSOCIATES.

HENRY JULIUS KALTENBACH, Yonkers, N. Y.
ALFRED LIEBMANN, New York City.
HOUSTON LOWE, Dayton, Ohio.
FRED LINCOLN STEARNS, New York City.

AS JUNIORS.

BERTRAND FAUGÈRES BELL, Chillicothe, Ohio.
SAMUEL ALLEN COBB, Muskogee, Ind. T.
ALBERT HOWARD HORTON, Detroit, Mich.
RICHARD DENNY PARKER, Palestine, Tex.
RALPH FENNU PROCTOR, Detroit, Mich.
CHARLES LUCAS WACHTER, New York City.

The Secretary announced the death of the following members:

WILLIAM SHATTUCK LINCOLN, elected Member Dec. 5th, 1883; died May 16th, 1902.
EDWARD JOSIAH BLAKE, elected Member April 3d, 1889; died May 29th, 1902.
ROBERT HENRY TEMPLE, elected Member May 6th, 1885; died December 23d, 1901.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

May 21st, 1902.—The Board met, as required by the Constitution, during the Annual Convention, Washington, D. C.; President Moore in the chair; Charles Warren Hunt, Secretary; and present, also, Messrs. Croes, Endicott, Kuichling, O'Rourke, Pegram and Seaman.

No quorum being present, the meeting adjourned.

June 3d, 1902.—Vice-President Schneider in the chair; Charles Warren Hunt, Secretary; and present, also, Messrs. Briggs, Croes, Endicott, Kuichling, Pegram and Seaman.

The report of the Nominating Committee was received.

The Secretary reported the receipt, through the U. S. Commission to the Paris Exposition of 1900, of a Diploma and of a Bronze Medal awarded to the Society for its exhibit.

Action was taken in the matter of having a tree planted at Mount Vernon, Va., commemorative of the visit of this Society to the home of Washington on May 22d, 1902.

Reconsideration ballots were canvassed and Arnold Henry Sutermeister was declared elected a member of the Society.

Applications were considered and other routine business transacted.

Four candidates for Associate and six for Junior were elected.*

Adjourned.

* See pages 176 and 177.

**REPORT IN FULL OF THE FIRST SESSION OF THE THIRTY-FOURTH ANNUAL CONVENTION, INCLUDING THE BUSINESS MEETING, HELD AT THE WILLARD HOTEL,
WASHINGTON, D. C.**

Tuesday, May 20th, 1902, 10 A. M.

MORDECAI T. ENDICOTT, M. Am. Soc. C. E.—Ladies and gentlemen: It devolves upon me, as Chairman of the Committee of the Board of Direction in general charge of the Convention, to call this, the 34th Annual Convention of the American Society of Civil Engineers, to order, which I now do. Meeting Convened.

Distinguished gentlemen are here to greet you to the National Capital, and without further words, I take pleasure in introducing to you the Hon. H. B. F. Macfarland, President of the Board of Commissioners of the District of Columbia.

HON. H. B. F. MACFARLAND.—Ladies and gentlemen: We are very glad to see you here. We are giving you a warm welcome, even though we have to force the season a little to do it. We wanted you to have a taste of the typical Washington summer, a little warm, but breezy. We always have these delightful breezes—up here—(laughter), and to give you the sense of being at home, as you think of the warmer climates from which so many of you come. Here in this hall, looking out from these windows, you get the inspiration of the Washington surroundings, which, in itself, furnishes a reason for your being here.

The Government of the District of Columbia is especially glad to welcome this Society, on its semi-centenary, to the National Capital, for this National Society, with its international membership, representing, as I understand, every continent and all the great isles of the sea, has, through many of its members, rendered important services to the National Capital. We recognize to-day not only the appropriateness of your meeting in the Capital of the country, which in the fifty years since your Society was founded has been distinguished by your achievements, but a feeling of gratitude on the part of the citizens of the District of Columbia for what you have done here.

The City of Washington might be said to be, of all the cities in the world, the work of engineers. George Washington, father not only of his country, but of its capital, who, as a boy leaving school forever for the university of life, made his first money and his first reputation as a surveyor and engineer, whose name the Federal City inevitably bears, Pierre Charles L'Enfant, the brilliant Frenchman, and Andrew Elliott, the brilliant American—these are the names that immediately arise in our minds as we think of the beginning of the permanent seat of government of the United States.

Addresses of
Welcome
(continued). Washington, more entirely than any other city in the world, not excepting St. Petersburg, I suppose, was designed throughout on engineers' plans, and was built up in conformity with them. Its convenience, its healthfulness, its beauty, are due largely to the fact that during the many years when the District of Columbia had no executive government, and no general development of the original plan of improvements was carried on, engineers were busy usefully here. They constructed the Washington aqueduct, they built buildings, they built bridges. Since 1878, when the permanent executive government of the District was established, the National Capital has been most fortunate in having the only complete engineering department, manned throughout by engineers, to be found, I suppose, anywhere.

Much of the success of the present form of government is due to the fact that all engineering and construction work has been in charge of engineers of high character and capacity. As a citizen of the District, only temporarily in office, I am glad to acknowledge the great debt which we citizens of the United States owe, and which the people of the whole country, whose capital this is, owe to the honest, intelligent and efficient men who have successively served as engineer commissioners and assistants to the engineer commissioners of the District of Columbia. They have, without exception, maintained the high reputation of the Corps of Engineers of the United States Army, and they have, in many cases, won the personal and lasting regard of the people of the District. I can speak from intimate knowledge of their work of recent years, beginning with that of former Commissioner Black, and I want to say that it commands my hearty admiration. These distinguished army officers have had the assistance of a permanent staff of civil engineers gathered through years of careful selection, which is not, I venture to say, excelled by any similar body of men anywhere in the world; appointed, retained and promoted on merit alone. Encouraged and stimulated by every honorable incentive, these men have done and are doing remarkable work.

Throughout nearly a quarter of a century, the Engineering Department of the District of Columbia has had a shining reputation for honesty and efficiency, and deserves and has received the confidence and appreciation of all that is best in our citizenship. Other engineers completed the Washington Monument and built the Library of Congress, and still others have cared for the beautiful parks that you see all around you. Indeed, you behold the monument of engineers wherever you look around in the District of Columbia. You, of all men, will appreciate what they have done and also all that is planned to be done in the development and embellishment of that Capital which every American wants to see the finest in the world. (Applause.)

THE CHAIRMAN.—I take pleasure in introducing the Chairman of the Local Committee in charge of this Convention, Rear-Admiral George W. Melville, who will now address you. (Applause.)

REAR-ADMIRAL GEORGE W. MELVILLE, U. S. N., Hon. M. Am. Soc. C. E.—Mr. President and Gentlemen: The Local Committee of Arrangements, in behalf of the resident members, extends a cordial welcome to the American Society of Civil Engineers in convention assembled. Your presence in this city also affords satisfaction and pleasure to the resident members of the allied engineering organizations. There are in the District of Columbia over one thousand graduates of technological institutions. The local alumni, of practically every scientific college in the country, recognize the fact that the benefits accruing from your deliberations will result to the advantage and enlarged prestige of the engineering profession, and therefore give you an earnest greeting.

It was thoughtful action which determined the selection of the Capital City as a place for your Annual Meeting, for Washington is, in fact, if not in name, an engineering center. It is true that the public at large has not heretofore regarded this city as such a center of technical influence. Nevertheless, the recognition of engineering as a profession has been due in great part to the scientific problems solved at the National Capital. It has only been because the engineering influence of this city has been overshadowed by its executive and legislative environments that Washington's importance as respects engineering has not been better appreciated and understood.

In at least four of the Executive Departments, the Engineer, whether or not this is his title, directs the professional work of many of the leading bureaus. As for the War and Navy Departments, the line separating the work of the military and naval officer from that of the engineer is very indistinct. In the design and mount of a gun, in the laying out of fortifications, in the building of docks, in the construction of a battleship, in the transportation of troops and supplies, and in the management of arsenals and naval stations, engineering executive ability of a high order is required.

Numerous excursions have been projected for your personal pleasure and professional profit. These trips are of such varied nature that you will better realize the important part that devolves upon engineering in the conduct of administrative affairs. If time will permit you to make careful investigation, you will be strikingly impressed with the fact that, so far as the future is concerned, the estimation in which engineering is held by the National Congress may determine the scope of the influence which will be exerted by the profession throughout the country at large.

It is in this city where many of the most imposing buildings in America can be seen, and the design of these edifices is the product of the mind of an engineer, for surely the architect can be regarded as an engineering specialist.

One of the best appointed and most complete gun foundries in the world will be open to your inspection, and one need have but a cur-

Addresses of
Welcome
(continued).

sory knowledge of the principles underlying the mechanic arts to understand that the ordnance expert could accomplish little if he were not an engineer.

During your visit to the Navy Yard you will be shown the experimental basin or model tank for determining many questions relating to naval architecture and marine engineering. In some respects this experimental tank is unrivaled by any in the world. It should be of incalculable benefit to the study of naval architecture and marine engineering, if operated under the supervision of the National Engineering Societies in conjunction with naval experts.

The various Executive Departments will also tell of the engineering opportunities presented to the profession, and of the necessity for our members to keep in touch with the professional work done at the Capital. The more time that is given to a study of the work of these departments, the greater will appear the necessity for all the engineering associations to meet oftener in convention in this city. There is a wealth of professional literature in the libraries of the various Executive Departments that can only be appreciated by the resident members. Rare and valuable books have been collected with judgment and discretion, and these professional works are accessible to every engineer. The technical libraries at the National Capital are well indexed, and in no city ought the engineering student find more opportunities and encouragement for original research.

The National Congress, in its investigation of hundreds of bills that are introduced each session, calls for technical and engineering opinions that require a high order of professional intelligence to answer. Probably the greatest tribute that could be paid to the work and worth of the engineering profession lies in the fact that, in both Houses of the Congress, the belief prevails that the report of a Board of Engineers is the carefully considered opinion of experts of integrity and efficiency.

Heretofore, the engineering profession has labored under the impression that Washington was a place where legal, medical, religious and political conventions should be held, but a city whose environments were not compatible to an assembling of engineers. It has been to the material disadvantage of the profession at large that this opinion should prevail. The unrivaled press organizations that are in existence in this city give particular attention to reporting the proceedings of all national associations. The professional treatises that will be read at the meeting, with the attendant discussions, will thus be telegraphed daily and be brought to the attention of the members of the Society throughout the country.

One of the many beneficial results that will be secured from your visit will be the fact that it will direct the attention of other engineering associations to the advantages of doing work of a national character. The scope and character of the work of the engineer will never receive the recognition that is its due until the executive officers of the

Government and the members of the National Congress fully realize the amount of study and practical experience that is necessary to fit one for professional engineering work. If the various engineering associations will frequently meet here, and if we can assemble an Engineering Congress in Washington every ten years, it will not be long before the country will realize the scientific depth and breadth, as well as the vital import and universal scope, of engineering work. If study, reflection, preparation, experience and character are the factors requisite for national leadership, then engineering has a claim to high recognition in bringing about national progress and prosperity.

It has been said that five elements are essential to the performance of great purposes: Time, place, opportunity, incentive, and the man. The Committee are to be congratulated in having secured two of the essential factors for a successful convention. At this period of the year the city appears at its best, for the atmospheric conditions are not only favorable to professional work, but also for that broad observation which should be acquired by every well-rounded professional man. It is also an opportune time by reason of the fact that the National Congress is in session, and the Capital City is filled with influential personages from all parts of the country. The character and nature of your work should be brought to the attention of such persons, since they are the ones who dominate national affairs. It has been a weakness upon the part of the engineering profession in the past that the various associations have held their annual conventions in places where it has been impossible for the national feature of our work to be brought into prominence.

The engineer was a dominant factor during the past hundred years, although he was neither accorded the honor, nor received the rewards of his achievements. It is highly probable that his influence will be even greater in the present century. In the future there awaits him the recognition which is his just due. With such incentives as the recognition of the world at large for his professional achievements, and substantial rewards for the accomplishment of great enterprises, it can be expected that men will come to the front who will honor themselves and their profession, and render the world a great service in accomplishing engineering feats which will surpass those of the last century. Gentlemen, we welcome you. (Applause.)

The CHAIRMAN.—We will depart from the line marked out here, for the purpose of introducing, before the history of the Society is read, our President, Mr. Robert Moore, who will address you.

ROBERT MOORE, President, Am. Soc. C. E.—Mr. Chairman, in taking the chair to which you have called me, I know I express the sentiments of every member of the Society, as well as of our guests, in expressing my thanks and appreciation for the words of welcome and the deeds of welcome which those words foreshadow, which you have heard from those who have welcomed us this morning, and I cannot help

Addressed (continued). expressing my very high appreciation of the thoughtful skill which the gentleman has indicated on the part of the Committee in furnishing to us, who come from the cool summer resorts of the middle West, a brilliant example of true home weather. And much more than this, as has been indicated, makes us feel at home in Washington. It is truly a city of which engineers may well feel proud, bearing as it does, the name of one who was not only the father of his country, but one whose name the city bears, and whom we are also glad to recognize as a fellow member of our profession. We, therefore, as citizens of the United States, feel also as citizens of Washington, and I am sure that, after the addresses that we have heard, we will also feel that, for the time at least, it is our home. Again I wish to express to you our hearty appreciation and thanks for your welcome. (Applause.)

The Board of Direction has thought it wise to recognize the fact that this is the semi-centennial of the Society by putting first in the order of exercises a sketch of the history of this, our beloved Society, and I therefore take pleasure in calling to the stand Mr. Charles Warren Hunt, who will give you a brief outline of the first fifty years of the life of the American Society of Civil Engineers. (Applause.)

Charles Warren Hunt, M. Am. Soc. C. E., then addressed the Convention on the history of the Society.*

GEN. WM. P. CRAIGHILL, Past-President, Am. Soc. C. E.—Mr. President, I have arrived at the age when I sympathize with old men, and I discover from this very interesting address that one of the original members of the American Society of Civil Engineers is still living in the City of Mexico. It seems to me that it would be proper that we should send to him a telegram of congratulation, and I make that motion. (Applause.)

The motion, being duly seconded and put to vote, was unanimously carried, and the Secretary was instructed to send a telegram in accordance therewith.

The President then delivered the Annual Address.†

THE SECRETARY.—The programme, I think, everybody has seen, and, as far as the Secretary knows, that programme will be carried out as printed, except that there will be a few slight modifications which will be mentioned by members of the Local Committee who are present.

I would like to read one or two letters.

“ PHILADELPHIA, Pa., May 19th, 1902.

Letters. “ MR. C. W. HUNT,

“ *Secretary, American Society of Civil Engineers,*

“ Willard’s Hotel, Washington, D. C.

“ DEAR SIR,—The Fifth Annual Meeting of the American Section of the International Association for Testing Materials will be held at the Hotel Traymore, Atlantic City, on June 12th, 13th, 14th. Numerous

* *Transactions*, Am. Soc. C. E., Vol. xlvi, p. 220.

† *Transactions*, Am. Soc. C. E., Vol. xlvi, p. 227.

papers on the physical and chemical properties of the materials of engineering will be presented at this meeting by recognized authorities, and certain features of the Standard Specifications for Steel Rails adopted by this Society will be taken up for further discussion.

"The Executive Committee desires to extend a cordial invitation to the members of the Committee on Rails, and to any other members of the American Society of Civil Engineers, interested in these subjects, to attend this meeting and to participate freely in the discussions. Copies of the programme will be gladly furnished on application to the Secretary.

"Very truly yours,

"EDGAR MARBURG,

"Secretary."

"WASHINGTON, D. C., May 19th, 1902.

"CHARLES WARREN HUNT, Esq.,

"Secretary, American Society of Civil Engineers,

"Washington, D. C.

"SIR,—The Capital Traction Company takes pleasure in extending to the members of the American Society of Civil Engineers, and their guests, in attendance upon the Annual Convention, held in this city during the four days, May 20th to 23d, inclusive, free transportation over the lines of its system, the only requirement being the wearing of the official badge of the Convention in full view while on the cars of the company.

"Yours very truly,

"G. T. DUNLOP,

"President."

"WASHINGTON, D. C., February 10th, 1902.

"MR. CHAS. WARREN HUNT,

"Secretary, American Society of Civil Engineers,

"220 West Fifty-seventh Street,

"New York City.

"DEAR SIR,—My attention has been called to the recent meeting in this city of the local membership of the American Society of Civil Engineers; also of the proposed convention of the Society to be held in Washington in May next, and it has been suggested by members of the Society connected with the Geological Survey that an opportunity should be offered to the visiting members during the convention to inspect the different branches of the Survey which may be of interest to civil engineers.

"The geologic work, as related to mining; the topographic survey, its methods and maps; the engraving on copper and printing from the stone of maps in colors; the hydrographic work, bearing upon the water resources of the country, and methods of stream measurement, are all features which will doubtless be of interest to members of the Society, and I take pleasure in offering such facilities of inspection as may seem to be best suited to the occasion, as may hereafter be determined upon by the Committee.

"Yours, with respect,

"CHAS. D. WOLCOTT,

"Director."

Letters
(continued)

"WASHINGTON, D. C., May 17th, 1902.

"*To the Secretary of the American Society of Civil Engineers,*

"Washington, D. C.

"SIR.—I take pleasure in sending to you herewith five hundred copies of the topographic map of Washington and vicinity for distribution to the members of your Society at your annual convention to be held in this city.

"Very respectfully,

"CHAS. D. WOLCOTT,

"*Director.*"

"WASHINGTON, D. C., May 19th, 1902.

"MR. CHARLES WARREN HUNT,

"*Secretary, American Society of Civil Engineers.*

"DEAR SIR—I beg to tender to members of your Society visiting Washington, as well as resident members, an invitation to visit the Capitol Building. Directions will be given to the various heads of departments, under my supervision, to extend to members every courtesy within their power. It will give me great pleasure to meet personally any who desire to call at this office.

"Very truly yours,

"ELLIOTT WOODS,

"*Supt., etc.*"

"COSMOS CLUB,

"WASHINGTON, D. C., May 20th, 1902.

"MR. CHARLES WARREN HUNT,

"*Secretary, A. S. C. E.,*

"The New Willard Hotel,

"Washington, D. C.

"MY DEAR SIR.—The Board of Managers of this Club wishes to extend the courtesies of the Club to the members of your Society during the time of the present meeting.

"Yours very truly,

"L. O. HOWARD,

"*Secretary.*"

"COMMANDANT'S OFFICE,

"UNITED STATES NAVY YARD,

"WASHINGTON, D. C., May 19th, 1902.

"DEAR MELVILLE.—Thanks for the invitation to be the guest of the Society of Civil Engineers this week. I find in the programme a visit to the Navy Yard, Wednesday afternoon, and for the entertainment of the visitors we have arranged to put a jacket on a 12-in. gun, about 2.30 that day. We had intended to do this to-day, but postponed it to Wednesday that members of the Society might see it.

"Hastily yours,

"TERRY."

BERNARD R. GREEN, M. Am. Soc. C. E.—I want to introduce a resolution, but prior to that I want to say that the Local Committee understands there may be warmer weather this week, and, therefore, a less suitable time is coming to put the jacket on that gun. (Laughter.)

They need a great deal of heat, however, for that purpose.

As a member of the Local Committee, I beg to offer the following resolution:

"That the officers of the Corps of Engineers of the United States Invitations Army—the local officers—the local officers of the Corps of Engineers of the United States Navy, the civil engineers of the city, not members of this Society, and the Washington Chapter of the American Institute of Architects, be invited to attend the meetings of this Convention."

The resolution, being duly seconded, was carried unanimously.

DAVID S. CARLL, M. Am. Soc. C. E.—The Secretary has read the letter of the President of the Traction Company. A number have asked what lines the Traction Company operates. They operate the cars running on Pennsylvania Avenue, out 14th Street, out 7th Street, and out to the Zoological Park. There is a map of the whole system in the rear of the hall. On that map the lines of the Traction Company are shown by heavy dotted lines. I wish further to call your attention to the excursion this afternoon to Cabin John Bridge. The programmes are wrong, and if you will look at the head of the list of members you will find that it says, "through the courtesy of the Washington Traction Company." It should be "the Washington Railway and Electric Company." It also says that the cars will be waiting in front of the Ebbitt House. Now, the cars can't wait, although it says that they can, because there is a three-minute service on the road, which they must maintain, but there will be plenty of cars there for all who want to go to Cabin John Bridge, through the courtesy of the Washington Railway and Electric Company.

WILLIAM M. BLACK, M. Am. Soc. C. E.—Ladies and gentlemen, there is something that may be an attraction for some of you which is not down on the programme. The Engineers' School and Battalion is stationed at Washington Barracks, and it says on the programme they will give you a pontoon bridge-building drill on Thursday morning. In addition to that, I wish to state that every evening of this week, except Thursday and Saturday, there will be a regular guard mounting, concert and parade, beginning at five o'clock. Guard mounting at five o'clock sharp, concert, and then dress parade at half-past five every evening, and we would like to see you down there. Take Pennsylvania Avenue cars and change at Seventh Street. That takes you down to the Post.

DAVID S. CARLL.—Free.

MR. BLACK.—Mr. Carll says free, but if you take the other line on F Street and then change at the corner of 9th and F Streets, that line will also take you down to the gates of the Post, going down 9th Street, and we would be very glad to see any of you. As I said, guard mounting is at five o'clock, band concert immediately after, and dress parade at half-past five. The Secretary desires me also to say that, the Convention being unexpectedly large and the excursion unex-

Invitations
(continued). pectedly popular, we will have to make a slight change in the excursion on Thursday, to this extent: Marshall Hall can only accommodate 500 persons, so that the tickets, which will include the dinner on Thursday, will be limited to 500, and those who haven't them may not get them, because there are only about 120 left. However, there will be, in addition to that, 200 tickets at 75 cents each, which will not include the dinner, but anyone getting a 75-cent ticket will be able to buy a small lunch on the boat. The boat is large enough; simply the accommodations at Marshall Hall for planked shad are limited.

There being no further business, the meeting was adjourned.

BUSINESS MEETING.

Business
Meeting
Convened. **Wednesday, May 21st, 1902.**—The meeting was called to order at 10.30 a. m.; President Robert Moore in the Chair; Chas. Warren Hunt, Secretary.

Report of
Committee on
Regulating
Practice of
Engineering. **THE PRESIDENT.**—Gentlemen, this being the Annual Business Meeting, a very important meeting in the affairs of the Society, we will proceed to business. The first thing on the programme is a report of the Committee, appointed at the Niagara Convention, on the desirability of action being taken for the protection of engineers and the public from incompetent practitioners.

The Secretary read the report as follows:

REPORT OF THE COMMITTEE ON REGULATING THE PRACTICE OF ENGINEERING.

To THE AMERICAN SOCIETY OF CIVIL ENGINEERS:

The Committee authorized by the last Annual Convention, and appointed by the President, to consider and report upon the advisability and practicability of regulating the practice of Engineering, with the object of excluding incompetent persons from practice, begs leave to present the following report:

In the prosecution of its work the Committee made an effort to collect information relating to what has already been done, or attempted, to regulate the practice of the profession in this and other countries, and also to learn, as far as practicable, what has been done by other professions and by some trades toward regulating their practice, and a brief synopsis may be of interest.

So far as the Committee is advised, there exist no laws in the United States regulating or limiting the practice of Engineering in any of its branches, with the exception of the Architects' law mentioned later. Efforts have been made in a few States to secure the enactment of such laws, but without success.

In Canada the subject has been agitated for a number of years, with the result that acts relating to Civil Engineers have been passed

in the Provinces of Quebec and Manitoba. These acts are quite similar in their essential requirements. The Quebec law, which was approved January 15th, 1898, after reciting in the preamble the fact of the incorporation of the Canadian Society of Civil Engineers, and declaring that it is desirable to establish the qualifications necessary to authorize persons to practice as Civil Engineers in the Province, enacts that, after January 1st, 1899, no person shall be entitled to use the title of Civil Engineer or to practice the profession unless he shall be, or shall become, a member of the Canadian Society of Civil Engineers. It defines the qualifications necessary for admission to the Society, and the conditions of membership. A board of examiners is constituted, consisting of six persons, four of whom shall be named by the Council of the Society, and one each by McGill University and Laval University. This Board shall meet at least twice each year to examine candidates who may apply for admission to the Society either as students or as corporate members. Those admitted as students may be, after passing a later prescribed examination, admitted as corporate members. In either case the applicant must pay in advance of the examination the entrance fees to the Society. Persons who pass the advanced examination receive a diploma, and become, without further action on the part of the Society, corporate members.

The act prescribes that no by-law that may be adopted by the Society shall have force or effect until approved by the Lieutenant Governor of the Province. The practical effect of the law is to make corporate membership in the Canadian Society of Civil Engineers the condition upon which the profession may be practiced in the Province. Exception is made in the case of persons authorized to practice by previous legislation. Persons not thus authorized to practice cannot recover before any court or justice any sum of money for civil engineering services, and they are liable to a fine not exceeding \$25 for assuming or using the title of Civil Engineer or of membership in the Society.

The Manitoba Act, approved March 19th, 1899, after referring more in detail to the organization and management of the Canadian Society of Civil Engineers, closes with a section (17), as follows:

"On and after the 1st day of July, 1896, no person shall be entitled within this Province to take or use the name and title of 'Civil Engineer' or any abbreviation thereof, either alone or in combination with any other word or words, or any name, title or description implying that he is a member of the said Society of Civil Engineers, or act as Engineer in laying out, advising on, constructing or superintending the construction of any railway or public work, or any work upon which public money is expended, the cost of which shall exceed \$500, unless such person is a member of the Society hereby incorporated and registered as such under the provisions of this Act, or unless he is a duly qualified Civil Engineer, and entitled to use the title of Civil

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Engineer by virtue of some statute in force in this Province, or by the authority of some institution of learning in this Province having authority to confer degrees in Civil Engineering, or unless he has been practising as a Civil Engineer in this Province at the time of the passing of this Act, or unless he is a member in good standing of some Institution of Civil Engineers in Great Britain and Ireland, or of some National Society of Civil Engineers of good standing in any foreign country."

It will be noted that while the leading provisions of this Act are quite similar to those of the Quebec Act, it is somewhat more liberal, since it exempts persons practicing Civil Engineering at the time the act was passed, as well as members of National Societies of Civil Engineers, and those upon whom the degree of Civil Engineer may be conferred by institutions of learning. The Act provides no penalty for its violation. Efforts have been made to secure the passage of a similar law by the Provincial Parliament of the Province of Ontario, but so far without success, an act very similar to the Quebec Act having been rejected at the last session of the Parliament.

These Canadian measures have not been in force long enough to afford a practical test of their value, particularly as no serious attempt has yet been made to enforce them rigorously. It seems to be felt that such enforcement must await the adoption of similar legislation in the other Provinces, and that they must, for the present, be regarded as little more than educational in character.

Mexico has a system of licensing Engineers that possesses, in theory at least, some meritorious features. In the regular course of introduction to practice, all candidates for professional pursuits must take the prescribed course of study in the official Government schools, which are organized and conducted upon something like the same lines as the military and naval academies at West Point and Annapolis. Candidates for the profession of Engineering must spend the last year of the course of study in the field upon some public work in course of construction. The Government makes provision for this by inserting in all Government concessions and contracts a clause requiring the concessionaries or contractors to provide for the reception of these students upon their work, a salary or allowance sufficient for their support being provided by the Government. The students must study the practical features of the work with which they are connected, and must prepare drawings and reports upon the same, which they must present for their final examination at the end of the year. If they pass this examination successfully they receive their "title" or diploma, which authorizes them to practice the profession in any part of Mexico. Persons, either native or foreign, not graduates of the Government schools, may be granted similar titles to practice, by passing a prescribed examination, among the requirements for which are a knowledge of the Spanish language, and the presentation of drawings of

works with which they have been connected. Graduates of technical schools, other than those of the Mexican Government, and members of foreign engineering societies are entitled to enter these examinations. The law does not, however, prohibit professional practice by those, whether native or foreign, who do not possess Government titles or licenses, but all plans, reports, etc., which require the approval of the Government, all Government land surveys and all engineering documents to go before the courts, must be signed by a titled engineer. In practice, however, it is stated to be quite usual for such work to be done by untitled engineers who then secure the signature of a titled engineer, though he may not have had any other connection with the work, or may be employed by the untitled engineer in some subordinate position. Whatever opinion may be held as to the practical utility of the system, it undoubtedly conveys upon the profession a certain degree of dignity and standing that would otherwise be wanting.

The Committee has not been able to ascertain that any provision exists in European countries for the licensing of engineers or for the regulation of professional practice except in so far as such regulation may be brought about by the civil service examinations in force in most of these countries. In governmental work the graduates of official technical schools are required to perform certain duties, and they enjoy certain advantages, but no restriction is placed upon the general practice of the profession by any who may choose to engage in engineering work.

Correspondence with engineers in England, Germany and France indicates that in their opinion no legal regulation of practice has been found necessary or is thought desirable.

With the exception of the Ministry, practice in all the professions other than Engineering is regulated by law in nearly all the States of the United States, and, while we cannot attempt to go into detail, it may be well to refer in a general way to what has been done in these other professions.

It is a noteworthy fact that as a rule the most stringent measures and the highest standard of requirements are found in the older and more completely developed States, and that the standard of preparation and proficiency required, as well as the penalties prescribed for practicing without proper authorization, have been advanced materially in recent years.

In the Law, regulations governing admission to the Bar are in force in all the States and Territories. The States of New York and Illinois may be taken as examples of the latest and most advanced requirements in that profession.

In New York, applicants for admission to the Bar must undergo a formal examination before a Board constituted for the purpose. In

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addition to a good general education, the applicant must satisfy the Board that he has pursued the study of Law for at least three years, and must pass an examination upon legal subjects selected by the Board. In Illinois, similar requirements are made as to a good general education and three years' study, and the examination covers all the leading branches of the law. This examination is so severe that there are many failures to pass, even by graduates of law schools.

Attorneys from other States are admitted upon affidavit that the course of study pursued by them was equal to that required in the State, that they were regularly admitted to the Bar, and that they have practiced two full years.

In the Medical profession there has been a marked increase in the requirements, though there is great diversity in those of the different States. New York requires a candidate to have a general education equivalent to a good high-school course; to have studied medicine not less than four full school years of at least nine months each, including not less than four satisfactory courses of at least six months each in four different calendar years in a medical college, resulting in a degree of M. B. or M. D.; or a diploma or license entitling him to practice in some foreign country. The candidate is then examined in anatomy, physiology, hygiene, chemistry, surgery, obstetrics, pathology and diagnosis, and therapeutics, including practice and *materia medica*. The fee for examination is \$25. The regulation of admission to practice is under the control of the Regents of the University, who appoint three State Examining Boards from lists furnished by the three State medical societies, who conduct the examinations; but the Regents issue the licenses. In Illinois, the whole matter is in the hands of the State Board of Health. The requirements are somewhat similar to those of New York, including the four years of medical study and the examination. The penalty for practicing without license is \$100 for the first offence and \$200 for each subsequent offence.

In Dentistry, license to practice is required in nearly all the States, such licenses being generally issued to those having diplomas from dental colleges, though twenty-three States require a special examination, even where the applicant is in possession of a diploma.

Teachers in the public schools must be licensed in all the States, and a distinctive feature of teachers' licenses is their classification with reference to the proficiency and experience of the applicant, so that the grade of license held by a teacher indicates to the public the relative ability and standing of its possessor.

In Architecture, efforts have been made in a number of States to secure legislation defining the duties and regulating the practice of architecture, but, up to the present time, only three States—California, New Jersey and Illinois—have laws licensing architects. The Committee is informed that there is much difference of opinion among

architects as to the desirability of such laws, and in a number of States where the matter has been agitated the profession has been found almost equally divided for and against them. The Illinois law went into effect July 1st, 1897. It is of unusual interest, as Architecture is a branch of Engineering, and the law and the examinations for which it provides are framed along lines more or less applicable to other branches of Engineering. The law has been in operation long enough to give some idea of its practical working. It may, therefore, be of interest to give an outline of its provisions and the results so far attained. The chief provisions are the following:

Every practicing Architect must be licensed. Any person practicing Architecture as a profession on July 1st, 1897, was, upon proof of that fact, entitled to a license without an examination of his qualifications. Other candidates for license must successfully pass a very full examination, which occupies three days, two of which are devoted to written examinations and one to planning and drawing. This examination has special reference to the construction of buildings, the strength of materials, the details of construction, the supervision of work in progress, and the application of sanitary science in building.

The practicing Architect must impress all plans, specifications, etc., issued from his office, with a seal bearing his name and address. Contractors may prepare their own working drawings, for work they have contracted to do, without violating the law.

The law defines "architect" and "building" as follows:

"Any person who shall be engaged in the planning or supervision of the erection, enlargement or alteration of buildings for others, and to be constructed by other persons than himself, shall be regarded as an architect, within the provisions of this act, and shall be held to comply with the same; but nothing contained in this act shall prevent the draughtsmen, students, clerks of works or superintendents, and other employees of those lawfully practicing as architects, under license as herein provided for, from acting under the instruction, control or supervision of their employers; or shall prevent the employment of superintendents of buildings, paid by the owners, from acting, if under the control and direction of a licensed architect who has prepared the drawings and specifications for the building. The term building in this act shall be understood to be a structure, consisting of foundation, walls and roofs, with or without the other parts; but nothing contained in this act shall be construed to prevent any person, mechanic or builder from making plans and specifications for, or supervising the erection, enlargement or alteration of any building that is to be constructed by himself or employees; nor shall a civil engineer be considered as an architect unless he plans, designs or supervises the erection of buildings, in which case he shall be subject to all the provisions of this act, and be considered as an architect."

The examination fee is \$15, and the license fee is \$25. The license must be renewed annually, for which the fee is \$5. Penalties of \$50 to \$500 are provided for practicing without a license.

Regarding the practical results from the operation of this law, Dr. N. Clifford Ricker, Professor of Architecture in the University of

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Illinois, and President of the State Board of Examiners of Architects, says:

"The general results of the law have been decidedly advantageous to the public, as well as to the profession. Numerous shysters and incompetents have been driven out of practice, especially in Chicago and its vicinity, where a considerable number of men have been prosecuted and fined. The professional status of the Architect has been very materially elevated, and the general public is learning that there is a difference between the Architect and the contractor, and to beware of a person attempting to perform both services at the same time. No man should have an interest in the profits of the erection of a building built under his direction and subject to his approval, acting as the expert advisor and agent of the owner. Draughtsmen in the larger offices have been restrained from practicing on their own account, unless they pass examinations and obtain a license. The professional education and training necessary to the successful practice of Architecture has very materially increased during the existence of the law. Nearly one-sixth of the number of architects licensed without examination have been replaced by men who have passed the examinations now required. At this rate, it may reasonably be expected that incompetent men among those licensed without examination will have left the profession at the end of the next ten years, when all practicing architects will have either passed the examination or possess equal preparation for the work. The professional standing for the architect should then in Illinois equal that of the lawyer or the physician."

In many of the "Trades," or guilds, of this country the conditions under which persons may assume to practice the art or skill of the trade have been quite effectively defined and regulated, but the Committee cannot take up this branch without encroaching too greatly upon the time of the Convention.

The arguments in favor of some effective measure to prevent the practice of quackery in the profession and to protect the public from imposition are so familiar to all that it is unnecessary to repeat and review them in this report. There can be no doubt that a large number among the reputable engineers now in practice are earnestly in favor of regulation and restriction, not only in the interest of the profession, but for the protection and benefit of the public. On the other hand, the discussion of the subject at the last Convention, and since, discloses clearly the fact that a large number of engineers, among them some of the leading members of the profession, believe that such restrictive measures are not only unnecessary, but inexpedient and unwise.

The members of the Committee are not unanimous in the opinion that it is desirable to restrict engineering practice in order to exclude incompetents, even if it were possible to secure satisfactory legislation to accomplish that purpose.

After a careful study of the matter in all its bearings the Committee has arrived at the conclusion that it is inexpedient for the Society to take any action in the matter, at this time, only one of its members inclining to the opposite view.

Some of the reasons that have led to this conclusion are the following:

Legislation intended to regulate and control professional practice should be of substantially uniform character and application throughout the whole of the United States. As it is not within the province of the National Government to enact such legislation, it could only be secured through the independent action of the several States. Experience in attempting to obtain uniform legislation relating to matters of great importance to society has demonstrated that it is very difficult, if not practically impossible, to secure the enactment of uniform laws in even a considerable number of separate States, though the measures proposed may meet the approval of the public, or may at least be not seriously opposed by any considerable number.

It is quite improbable that the legislation necessary to regulate engineering practice could be secured in the several States without the approval and active co-operation of a large majority of the people, and the Committee does not believe that it would be possible to arouse such a degree of public interest in the proposed legislation as to make its enactment possible.

The two main arguments that have been advanced in favor of a measure of this character are that it would be beneficial to the profession, and that it is necessary for the protection of the public. The fact that legislation is designed for the protection of any one class, however large and important that class may be, would very certainly arouse opposition to it, on general principles, and this opposition would be emphasized by the hostility of those whose personal interests might be affected thereby. It might be difficult to convince that part of the public who regard with suspicion any attempt to restrict personal liberty that the members of the profession, in urging such a measure, are actuated alone by a disinterested desire to elevate the profession and to protect the public, rather than by less worthy motives. To whatever extent individual employers may be imposed upon by engineering quackery, the results do not usually affect the community as a whole, and the public, therefore, does not take an active interest in the matter. In this respect engineering is different from the other professions in which legal regulation has been so generally adopted. Thus, the basis on which restrictive legislation has been secured in the practice of Medicine, Pharmacy and Dentistry is the police power of the State to protect life and health; the attorney is, in theory at least, an officer of the Court, and is, therefore, a part of the machinery for the administration of justice; and the character and ability of the public school teacher is a matter in which every citizen is interested and into which he has a right to inquire. No such broad and general basis can be claimed for the engineering profession, except, perhaps, in the case of engineers in official public service, and

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with regard to these it is doubtful whether restrictive legislation can be made to apply to elective officials, and there is reason to hope that the improvement and extension of the Civil Service system will effectually exclude incompetent appointees.

To secure the enactment of any laws of the character contemplated it would undoubtedly be essential that the profession shall be united in its demand for them. It is evident that at present such unanimity does not exist.

Granting that restrictive legislation could be secured, and enforced, a careful study of the details necessary to be considered in framing the terms of the measure discloses the fact that very serious difficulties would be met with in attempting to provide, on the one hand, such definite conditions as would make the enactment effective, but which would not, on the other hand, impose restrictions on the individual liberty of the citizen. In some respects the profession is anomalous. No precise and adequate definition of Civil Engineering has been proposed and accepted by either the profession or the public. The wide range and diverse nature of the work of the Engineer makes it very difficult to frame such a definition, and it is not easy to differentiate professional work from that which is not professional, or to distinguish between the function of the professional engineer and that of the skilled mechanic. Furthermore, the profession of Engineering is divided into a number of more or less distinct branches, each with its special line of practice, and each having a separate professional organization; but these branches are so intimately connected with each other, or they so overlap each other in practice, that it would be very difficult to define clearly the line of demarcation between them, and to frame laws which would apply to one without affecting the others. For this reason, if for no other, it would be very desirable that any legislative regulation should be of such a general character as to embrace the whole field of engineering. Such general legislation could not be framed without a very careful study of existing conditions, and of controlling facts and principles from the standpoint of each department of the general profession, and its passage could not be secured without the active co-operation of the professional organizations of the several divisions of the profession. With the exception of the Architects, the other branches of the profession, so far, have shown no active disposition to take up the matter of legislative control of professional practice, and the Committee is of the opinion that efforts to obtain their co-operation at the present time would be fruitless.

The application of the Civil Service examinations to candidates for professional positions in National, State and Municipal service, will, in time, render the existence of special restrictive legislation less important in these departments of professional work. Much remains

to be done before these examinations shall be entirely effective in sifting out a class of incompetents who have heretofore been able to obtain, through political or other influence, positions for which they were unfitted. The testimony of those whose experience makes their opinion of value indicates what while the machinery of the system, as applied to the technical classes, is as yet more or less crude, quite satisfactory results are being obtained, and the hope is justified that as the service is extended and perfected it may render other measures unnecessary wherever it is applicable.

The Committee therefore recommends that no further action be taken in the matter by the Society at the present time.

Respectfully submitted,

S. WHINERY,

DESMOND FITZGERALD,

J. F. WALLACE,

A. N. TALBOT,

EMIL KUCHLING.

THE PRESIDENT.—Gentlemen, what is your pleasure in regard to this report?

A MEMBER.—I move that it be accepted and adopted.

The motion, being duly seconded, was carried unanimously.

THE PRESIDENT.—The next order of business is the report of the Committee appointed at the Annual Meeting of January, 1902, to report on the method of classifying applicants for membership and of raising the qualifications for the various grades.

H. G. Prout, M. Am. Soc. C. E., read the report, as follows:

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REPORT OF A COMMITTEE ON CLASSIFICATION OF APPLICANTS FOR MEMBERSHIP AND ON RAISING THE STANDARD OF QUALIFICATIONS FOR MEMBERSHIP.

At the Annual Meeting of the American Society of Civil Engineers, held January 15th and 16th, 1902, the following resolutions were adopted:

(1) "*Resolved*, that it is the sense of this meeting that the Board of Direction shall have power to classify applicants before their names appear on any published list of candidates; and further

"*Resolved*, that a Committee be appointed to report an amendment to the Constitution which shall embody this idea, at the next Annual Convention for consideration.

(2) "*Resolved*, that a Committee be appointed to report to the next Annual Convention upon raising the standard of qualifications for the several grades of membership."

The President of the Society appointed the undersigned as a committee to report, under the provisions of these resolutions, at the

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Annual Convention to be held May 20th, and that Committee has the honor to report as follows:

(1) Under the present procedure the applicant for membership designates in his application the grade of membership into which he wishes to be elected. It is not material to consider now whether or not the Constitution requires such designation. The practice is established. His name goes out to the Society on the "blue list" as a candidate for membership in such grade. This also is established practice, although apparently not necessary under the Constitution. Not less than 20 days after the issue of the "blue list" the Board considers each application, and may, at its discretion, request the candidate to consent to re-classification; and finally may direct that the name go to ballot.

(2) A committee which reported at the last Annual Meeting found that in the last ten years 32 candidates, who had been rejected by the Society on the secret ballot, have asked for reconsideration, and have been voted upon by the signed ballot known as "the pink ballot." Of these 32, 19 were elected and 13 were defeated. These occurrences have caused some dissatisfaction with the present procedure, and the committee which reported at the Annual Meeting thought it probable that if the candidates were classified by the Board of Direction, the number of rejections would be greatly diminished.

(3) Those who have served on the Board are well aware that it is often expedient and desirable to ask a candidate to submit to a lower classification, and sometimes to accept a higher classification. But it is believed that many men would be reluctant to accept a classification lower than the one in which they have been rated in their first public appearance as candidates, namely, in the "blue list." It seems wise and politic that no public rating of candidates should be made until the Board has decided on the application of each candidate. But this decision cannot be made until that information has been gathered, to collect which the "blue list" is issued.

The Board has ample power now to classify candidates, as it may, at its own discretion, decline to pass a candidate to ballot in any one grade; but the Constitution has been construed to provide that the applicant shall himself designate the class to which he wishes to be elected or transferred, and the official forms of application have been made in accordance with this reading of the Constitution.

Furthermore, the practice has been established of printing the name of the candidate on the "blue list" under the grade which he has himself selected.

(4) As we read the Constitution, all that is asked for in the first of the resolutions under which we were appointed may be accomplished under the Constitution as it now stands, namely: (a) The Board may classify candidates at any stage of proceeding, and, in fact, does

classify them sooner or later. (b) The Board has now ample power to direct that the "blue list" shall be issued as an unclassified list of candidates. This is a matter of procedure to be governed by considerations of expediency.

(5) But it is desirable and important that the applicants should know from the outset that the Board must eventually designate the class under which any candidate goes to ballot; and that the Board should always have clearly in mind its power and duty in this respect. Further:

It is necessary that the Board should collect information before classifying the candidate, and the most economical and efficient way to collect that information appears to be to send out the name of the candidate on a preliminary list, the present "blue list." But it is important and desirable that in this preliminary list the candidate should appear merely as a candidate for election into the Society, or for transfer, with no indication of the grade to which he aspires.

In Sections 3 and 4 of this Report we have expressed the opinion that the Board has now, (1st) ample power to classify candidates; and, (2d) power to issue the "blue list" as an unclassified list. Yet, we are informed that the Board has interpreted the Constitution as restricting its power in the second particular.

(6) Therefore, in order to remove the idea that the "blue list" must be classified, at least so far as concerns the two grades of corporate membership, we recommend the following amendments to the Constitution:

Amend Art. III of the Constitution, as follows:

Section 2, first line, after the words "Society as," strike out the words "Member or as Associate" and insert the words "a Corporate"; second line, after the word "to" strike out the words "either grade of." Section 2, Art. III, will then read, "An application for admission to the Society as a Corporate Member, or for transfer from any other grade to Corporate Membership shall embody," the rest of the section standing as now.

Section 3, third line, after the word "membership" strike out the words "in any grade," and after the word "transfer" strike out the words "from one grade to another"; twelfth line, for the word "may" substitute the word "shall." The Section will then read as follows:

"At stated periods, to be determined by the Board of Direction, there shall be issued, to each member in any grade, whose address is known, a list of all new applications received for membership or for transfer, which list shall be dated and shall contain a concise statement of the record of each applicant and the names of the references in the case of Corporate Member, and endorsers in the case of Associate, Junior or Fellow, with a request that members transmit to the

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Board any information in their possession which may affect the disposition of the applications. Not less than twenty days after the issue of such list, the Board of Direction shall consider these applications, together with any information in regard to the applicants that may have been received; may make further inquiries, if deemed expedient; shall classify the applicant with his consent, and on applications for Corporate Membership may direct a ballot."

(7) While this report is desired especially to make clear the power and responsibility of the Board in the matters covered, we suggest further that much weight should be given by the Board to the information and opinion of those who write concerning the qualifications of the applicants. In the nature of things, the condensed and meager record of experience can give but an imperfect measure of a man's character and ability; and it may easily be misleading.

The second resolution under which we are appointed directs us to report upon "raising the standard of qualifications for the several grades of membership." The qualifications described in Art. II seem to be all that is judicious and expedient to set forth in the letter of the law. Their severity must remain largely a matter of interpretation by the Board of Direction. A Member must be 30 years old; in the Institution of Civil Engineers (British) he must be 25. He must have had 10 years of practice; in the Institution he must have had five years. In the Society he must have had responsible charge of work for five years and must be qualified to design; in the Institution he shall be actually engaged in a responsible situation. In the grade of Associate Member the Society requires 25 years of age, six years of practice, and one year of responsible charge; the Institution requires that the candidate shall be 25 years of age and shall be actually engaged in design or construction. It is quite apparent that the specified qualifications are higher in the Society than in the Institution. It is also apparent that the phrases "responsible charge" and "qualified to design as well as direct" are capable of a broad range of interpretation, but that they could not be accurately defined in the Constitution. Further, the most important qualifications for membership are not matters of education or ability, but of character; and character could be specified in a written constitution only in general terms. It follows that, in the end, the standard of qualifications for membership must rest mainly in the judgment of the Board of Direction.

It has been suggested that hereafter no new member be elected directly to the grade of Member; but that every Member be required to pass first through a lower grade. It does not seem expedient to put such a restriction on the power of the Board of Direction. If the Board is charged with the specific duty of classifying candidates before they are passed to ballot we may well rest there, for, as has been pointed

out above, the standard of qualifications comes back finally to the judgment of the Board.

We recommend no change in the qualifications for either grade as now prescribed in the Constitution.

All of which is respectfully submitted,

H. G. PROUT, *Chairman.*

H. A. CARSON,

T. H. JOHNSON,

E. J. BLAKE,

D. BONTECOU,

JAS. D. SCHUYLER.

I subscribe to the above report except the last paragraph which I would make to read as follows:

"We recommend no change in the qualifications for either grade of *corporate membership* as now prescribed in the Constitution."

G. S. WILLIAMS.

THE PRESIDENT.—What is your pleasure, gentlemen, with regard to this report? If there be no objection, it will be received and filed, and the question of its adoption will be left open. Is there any motion?

A MEMBER.—Will it be necessary to amend the Constitution as proposed?

THE PRESIDENT.—The reception of the report simply files it. If it is a question of the matter of the report, it should come up on a distinct motion, either to adopt the amendments of the Committee or to adopt other amendments.

A MEMBER.—I move that the report be received and filed.

The motion was duly seconded.

A MEMBER.—I would like to ask whether there is any motion necessary to secure the adoption of the amendments?

THE PRESIDENT.—I suppose amendments to the Constitution would have to pass the regular routine.

THE SECRETARY.—The Constitution provides that an amendment proposed by a certain number of members, I think five, shall be presented to the next general meeting of the Society for discussion. If that general meeting does not amend the proposed amendment, it must be voted upon by the Society at large. As I understand it, this is a report to the Society by a Committee, but, as individual members of the Society, no amendment has been proposed. It would therefore be necessary, in order to comply with the Constitution, that the members of the Committee, or some other members of the Society, should present the matter of this proposed amendment to the Constitution in the regular form, although the Committee could do that as well as anybody else.

THE PRESIDENT.—I think the interpretation of the Constitution by the Secretary is correct. Are there any remarks upon this motion,

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which is to receive and file this report? If not, those who are in favor of receiving and filing this report will signify by saying "aye."

The vote being taken, the President announced the motion carried.

WILLIAM P. CRAIGHILL, Past-President, Am. Soc. C. E.—If it be in order, I would like, at this stage of the proceedings, to offer a resolution looking to the amendment of the Constitution, following to some extent the line of the report of this Committee. If the Secretary will be kind enough to read it, and if it be in order, I will offer that resolution.

The Secretary then read the resolution, as follows:

Proposed
Amendment
to the
Constitution.

"Resolved, That the Board of Direction be requested to frame an amendment to the Constitution which shall do away with the secret letter-ballot now used in the election of corporate members, and substitute therefor an open or signed ballot."

The motion was seconded by A. P. Boller, M. Am. Soc. C. E.

Mr. CRAIGHILL.—I do not wish to detain the Society at this moment in a discussion of the resolution which is before the Society, but I want, however, to say this: Of course, I wouldn't have offered the resolution if I didn't approve it, and my approval is based upon experience, which is an excellent teacher, and that experience is one I had as a member of the Board of Direction for eight years. Of course I would be very glad to hear the resolution discussed, and after that would have something to say on the subject.

THE PRESIDENT.—The Chair would call attention to the first section of the article on amendments, which says:

"Proposed amendments to this Constitution must be reduced to writing and signed by not less than five Corporate Members, and be submitted and acted upon as follows."

Now, the point is whether the Board of Direction can submit an amendment except as individuals, and it seems to me that is the correct interpretation of the Constitution, that they cannot, in their official capacity, submit amendments; but that must be done by individuals, as indicated in this article.

THE SECRETARY.—I call attention to the fact that this resolution requests the Board of Direction to frame an amendment only, and necessarily it would have to come before the Society at another meeting. I don't know whether that would make any difference in your ruling or not.

MR. CRAIGHILL.—If you rule that the resolution is not in proper shape, I will withdraw it and put it in proper shape.

THE PRESIDENT.—As the Chair understands the resolution, it means that the Board should present the amendments. If it is only to frame them, I presume there is no objection to it.

MR. CRAIGHILL.—The reason the resolution is drawn in this shape is this: It is a subject that comes before the Board of Direction, and they are very familiar with the subject, more so than any other members of the

Society, and it seemed to me not improper that they should be called upon to put the amendment in proper shape for submission to the Society. The members of the Board of Direction are members of the Society, and, as I understand, the Constitution permits any members of the Society, whether they belong to the Board of Direction or otherwise, to submit amendments that may be incorporated in the Constitution in the proper way, so that the Constitution does not seem to me to disqualify the Board of Direction as members of the Society from taking any action that any other members of the Society might take.

J. JAMES R. CROES, Past-President, Am. Soc. C. E.—It seems to me it would give us a precedent in the presentation of such an amendment which would be misunderstood by a great many members. It would be equivalent to a recommendation by the Board of Direction that the Constitution be amended as proposed.

It appears like an effort to give an official sanction to the ideas of a few members preliminary to their being presented to the whole Society, which is not in accordance with the spirit of the Society or of the Constitution. If the gentlemen who desire this amendment will present it in proper shape, the matter can be brought before the Society as the action of individuals desiring the amendment, and not as the official action of the Board of Direction asking for an amendment to the Constitution, which they may or may not approve of. This would require them to present an amendment of which they might not approve, but they have got to present that amendment under that resolution. It isn't their business to do it, and it isn't proper it should be done that way.

H. B. SEAMAN, M. Am. Soc. C. E.—I was simply going to make some remarks in the general direction to which Mr. Croes' remarks tend, that this motion instructs the Board; it does not leave them any discretion as to the purpose of the motion to have signed ballots. I have not thought as much of it as some others and the gentleman himself, but it does not strike me favorably, for this reason, that the Board finds to-day the greatest difficulty in obtaining evidence against applicants although correspondence is supposed to be in every case confidential. People will not sign letters and send them in, even confidentially, to the Board. If such is the case, I think it will be much more difficult to persuade members to sign against applicants in an open ballot, and in that way we throw open the doors and will probably let in a great many objectionable candidates. It has been proposed that the election shall be placed entirely in the hands of the Board. Nobody knows the difficulty of such a proposition better than the members who have acted on the Board. It is a very difficult proposition, the proper election of our membership to-day, and the present agitation arises from the fact that almost anyone can get in through

Discussion on
1 proposed
Amendment
(continued). the pink ballot. I think it would be much easier for them to get in through the proposed amendment. There is another objection to the present system, which is that there is a great deal of blackballing; one member will blackball a whole list. I think the objections to the present system, although they are serious objections, are less than those to the system proposed.

MR. CRAIGHILL.—Would it be proper for me to offer a resolution requesting the President of the Society to appoint a Committee of members present to put this thing in proper shape? I want to see it go through, and I want to get it before the Society in a proper way. Would it be proper for me to move for the President to appoint a Committee of the members present, or any others he may think proper?

THE PRESIDENT.—I see no legal objection to that, although it is a question whether he could do it better than the members who would offer such an action; but that wouldn't go to the legality of it.

MR. CROES.—That would be open to the same objection which is made to this present amendment to the Constitution, which is presented by the Committee under the instruction of the Annual Meeting. It has been ruled that that report of the Committee reporting an amendment is not—

MR. CRAIGHILL.—May I interrupt for one moment?

THE PRESIDENT.—With Mr. Croes' permission.

MR. CRAIGHILL.—I withdraw the resolution.

MR. CROES.—I have nothing more to say then regarding that resolution, but I would like to call attention to the fact, if it is not too late to reverse the ruling of the Chair on that matter, that this Committee was appointed to make a report on the method of classifying applicants for membership, and they have made that report, and the ruling is made that it is not the offering of an amendment.

THE PRESIDENT.—I think that is correct. That amendment may be offered by five individuals.

MR. PROUT.—When a Committee is appointed to report an amendment, isn't the presentation of that report the offering of the amendment by the individuals composing that Committee?

THE PRESIDENT.—If they so offer it as individuals.

MR. PROUT.—Mr. President, the second resolution reads that a Committee be appointed to report an amendment to the Constitution. Now, our Committee considers that we have complied with our instructions to report an amendment to the Constitution. Whether we must now resolve ourselves into seven individuals and put in the amendment in another form is rather a nice question.

MR. CROES.—Does an amendment to the Constitution have to be offered at a regular meeting?

THE PRESIDENT.—No, sir.

MR. CROES.—Can the Committee or anybody else put their names to that and offer it?

THE PRESIDENT.—The article on amendments, Sections 1 and 2, reads:

"Proposed amendments to this Constitution must be reduced to writing and signed by not less than five Corporate Members, and be submitted and acted upon as follows:

"Amendments presented to the Secretary on or before the first Wednesday in November shall be sent by letter to the several Corporate Members of the Society at least twenty-five days previous to the Annual Meeting. Such amendments shall be in order for discussion at such Annual Meeting, and may be amended in any manner pertinent to the original amendments by a majority vote of the Annual Meeting, and if so amended, shall be voted upon by letter-ballot in form as amended by the Annual Meeting; if not so amended, they shall be voted upon by letter-ballot as submitted. * * *

I will not read the rest of it, but it seems to me this is exclusive of any other method of submitting amendments.

MR. PROUT.—Mr. President, the fourth section of this article says that if after discussion of a proposed amendment, at either of the general meetings of the Society, the meeting shall so decide by a majority vote, it may refer the amendment to a committee for further consideration, which committee shall report at the next general meeting.

Now it seems to me that that is precisely the procedure that has been taken, up to this stage. This was discussed at the last meeting. That meeting decided by a majority vote to refer it to a committee. It was referred to the Committee. Now, "which committee shall report at the next general meeting," which we have done this morning. "Whereupon the amendment shall be voted upon as hereinbefore provided." Now, we have got to that stage, it seems to me, to the stage hereinbefore provided, whatever that may be.

A MEMBER.—I would like to ask the speaker when it was that the amendment took the first step.

MR. PROUT.—Last January, at the Annual Meeting.

A MEMBER.—I was present at the meeting, but do not recollect it.

MR. PROUT.—Well, whenever the discussion came up.

A MEMBER.—Mr. Secretary, when was the amendment now presented as a report passed through its first stage and presented to the Society?

THE SECRETARY.—It has never gone through any stage.

HENRY S. HAINES, M. Am. Soc. C. E.—Mr. President, pardon me for intruding into this discussion, but I would like to ask the President what the question is.

THE PRESIDENT.—The question, as I understand it, is whether the recommendations of this Committee constitute a proposed amendment within the meaning of the Constitution.

Discussion on
Proposed
Amendment
(continued). MR. HAINES.—I thought the report of the Committee had been disposed of, and another matter was brought up, and that resolution was withdrawn. It is an entirely different matter.

THE PRESIDENT.—The report was received and filed, but that left open any further action upon the same subject, and Mr. Prout raises the question as to whether this is a proposed amendment, if proposed in the form already indicated by the Constitution.

THE SECRETARY.—Mr. President, there was an amendment to the Constitution proposed in due form last fall, and it came before the Annual Meeting, in January, and the action of that meeting—rather, not the action of that meeting, but the action under the Constitution, required that the amendment should go to ballot unless amended by the Annual Meeting. The Annual Meeting did not amend that amendment, and it went to ballot and was defeated. At that meeting this matter came up anew, and a Committee was formed and instructed to report on this matter. It was not an amendment which had been duly presented to the Society.

THE PRESIDENT.—In view of that state of facts the Chair thinks that this needs to be proposed as an original measure.

J. M. KNAF, M. Am. Soc. C. E.—Mr. President, I would suggest that Col. Prout, the Chairman of that Committee, secure four other good men to sign a well-worded amendment, and have it presented to this meeting. It seems to me that would simplify the matter, and then it can be put out as a proposed amendment. It has nothing to do with the reception of his report.

THE PRESIDENT.—Of course not. The report is received; and of course that amendment need not be made to this meeting. It cannot be acted upon as an amendment to the Constitution at this meeting, although discussion of the general subject is open.

MR. CROES.—It does seem that whether further consideration involves an amendment or not, the matter is referred to the Committee for further consideration, on which the Committee shall report at the next general meeting, whereupon the amendment shall be voted upon as hereinbefore provided.

THE PRESIDENT.—The question of fact, stated by the Secretary, without contradiction, as far as I know, is that an amendment on this general subject has been submitted to ballot and defeated, that another amendment upon the same general subject is proposed as suggested by this Committee, and that it does not become a proposed amendment within the meaning of the Constitution unless signed by five members and submitted in that form.

A MEMBER.—I move that this Committee be continued, to present the proposed amendment to the Constitution in due legal form to the Society.

The motion was duly seconded.

A MEMBER.—Is that motion constitutional?

THE PRESIDENT.—The Chair sees no reason to rule otherwise.

CLEMENS HERSCHEL, M. Am. Soc. C. E.—I should judge, from being an attentive listener, that that motion is unconstitutional. It is not the way to present the proposition. My sympathies are with the speaker who suggested to the Chair that there is no question before the meeting. Now, there is or is not a question before the meeting. If there is, I should like to have it put; if not, I should like to pass to something new.

THE PRESIDENT.—The motion last made, I think, is a proper one. I think this Committee can take steps to have it properly presented to the Society, and that motion is now before the house.

A MEMBER.—If it is in order to make a remark on that question, I think it is an unnecessary step. The Constitution has provided the means by which any set of five members can bring their wishes before the Society and have them acted upon by the whole Society. It does not seem competent for a convention meeting to take the initiative and instruct the Committee to do something. The meeting is not properly a body which can present the amendments. I think it is a waste of time to do this. It has got to be done and signed by five individuals, and it does not require this action.

MR. HERBERT M. WILSON.—Mr. President, is there a motion before the house?

THE PRESIDENT.—There is a motion before the house, which the stenographer will read.

MR. WILSON.—I should like to offer an amendment to it. I should like to amend that motion to read that this Society accept the amendment to the Constitution presented in writing and signed by this Committee as a formal amendment to the Constitution to go through its usual course.

MR. HERSCHEL.—I hope that the amendment and the motion to which it applies, both, will not prevail. It is the same thing Mr. Croes has spoken about, only in another form. It is giving an official sanction, and the sanction of the Society, as it were, to a petition that is going to be signed by five members. Now, why can't these five members act without this spur from the meeting? The Constitution says it must be done in that way, and, if it must be done in that way, it should not and probably cannot be done in any other way.

It was duly moved, seconded and carried that the matter be laid upon the table.

THE PRESIDENT.—The report of the time and place for holding the next Convention is the next order of business.

THE SECRETARY.—Mr. President, in answer to the usual circular which has been sent out, the members of the Society have replied as follows:

Report on
Time and Place
for next
Convention.

Report on
Time and Place
for next
Convention
(continued).

" NEW YORK, May 19th, 1902.

" To THE AMERICAN SOCIETY OF CIVIL ENGINEERS:

" I beg to report the result of the ballot on Time and Place for Holding the Annual Convention of 1903, as follows:

" Total number of votes received for Place (to May 19th, 1902), 306.

" Distributed as follows:

St. Louis, Mo.....	68	Havana, Cuba.....	5
Cleveland, Ohio.....	35	Birmingham, Ala.....	5
Pittsburg, Pa.....	28	Asheville, N. C.....	4
City of Mexico.....	26	Mackinaw Island.....	4
Chicago, Ill.....	23	Seattle, Wash.....	3
Boston, Mass.....	19	Philadelphia, Pa.....	3
New Orleans, La.....	14	Old Point Comfort, Va.....	3
New York City.....	9	Sault Ste. Marie, Mich.....	3
Denver, Colo.....	6	San Francisco, Cal.....	3

Some point on the Great Lakes..... 3

" The following places received 2 votes each:

Atlantic City, N. J.	Saratoga, N. Y.
Montreal, Canada.	Cincinnati, Ohio.
Minneapolis, Minn.	Niagara Falls, N. Y.

Atlanta, Ga.

" The following places received 1 vote each:

Albany, N. Y.	Dallas, Tex.
Lake Champlain, N. Y.	Coney Island, N. Y.
Lakewood, N. J.	Milwaukee, Wis.
Bar Harbor, Me.	Quebec, Canada.
Nantasket Beach, Mass.	White Sulphur Springs, Va.
Kansas City, Mo.	Halifax, Nova Scotia.
Alexandria Bay, N. Y.	Lake George, N. Y.
Richmond, Va.	Buffalo, N. Y.
Yellowstone National Park, Wyo.	Eureka Springs, Ark.
Tampa, Fla.	Charleston, S. C.
Norfolk, Va.	San Juan, Porto Rico.
Sydney, Cape Breton, Nova Scotia.	Thousand Islands, N. Y.
Duluth, Minn.	Katerskill, N. Y.
Hancock, Mich.	Some Canadian point.

" Total number of ballots received on Time for next Convention, 270.

	No. of votes.	No. of votes.
February	4	November..... 2
March	6	December..... 2
April	11	Autumn..... 1
May	87	Midsummer..... 1
June.....	107	Summer..... 1
July.....	16	Winter..... 1
August.....	7	Early Spring..... 1
September.....	10	Late Fall..... 1
October.....	5	During Exposition at St. Louis 7

" Since the foregoing list was compiled, more than 300 postal cards in favor of Cleveland, Ohio, have been received.

" Respectfully submitted.

" CHAS. WARREN HUNT,

" *Secretary.*"

Mr. President, this report was written before leaving New York. On the arrival of the special train at Washington, the Secretary received a stack of postal cards, all of which were votes for holding the convention in Cleveland. Some of them were reconsiderations of votes already received and referred to in this report. It has been impossible to classify those so as to give an accurate statement of the ballots as received, but there have been more than 300 votes, received since the Society has been in convention in Washington, in favor of holding the next convention in Cleveland. (Applause.)

A. MORDECAI, M. Am. Soc. C. E.—I think the Secretary has some invitations from Cleveland as to the convention which I should like to have read.

THE SECRETARY.—Also from other places.

MR. MORDECAI.—Only from Cleveland. I don't care anything about the other places.

THE PRESIDENT.—The Secretary will read them.

The Secretary read the following letters from Cleveland:

"CLEVELAND, OHIO, May 15th, 1902.

"*The American Society of Civil Engineers,*

" Willard Hotel,

" Washington, D. C.

"GENTLEMEN,—As Mayor of the City of Cleveland, I cordially invite your Association to hold its next convention in Cleveland. I am sure Cleveland will be proud of the honor and will put forth every effort to make your visit a pleasant one.

" Yours very truly,

" TOM L. JOHNSON,
" Mayor."

"*Mr. CHARLES WARREN HUNT,*

" Secretary,

" Washington, D. C."

"CLEVELAND, OHIO, May 19th, 1902.

"*Mr. CHARLES WARREN HUNT,*

" Secretary, *American Society of Civil Engineers,*

" Washington, D. C.

"DEAR SIR,—On behalf of the business men of Cleveland, the Board of Directors of the Cleveland Chamber of Commerce extends to your Society a very cordial invitation to hold its summer meeting of 1903 in Cleveland. The directors are confident that your delegates would thoroughly enjoy the time spent in Cleveland, and it is sincerely hoped that the city may be honored by an acceptance of this invitation.

" By order of the Board of Directors of the Cleveland Chamber of Commerce.

" F. A. SCOTT,
" Secretary."

"CLEVELAND, OHIO, 19th May, 1902.

"*Mr. CHARLES WARREN HUNT, Secretary,*

" and Members of the Am. Soc. C. E.

"GENTLEMEN,—It is with great pleasure that we hand you herewith the invitation of the Cleveland Chamber of Commerce for your

Letters
Regarding
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Convention.

Letters regarding next Convention (continued). summer meeting of 1903. We trust that Cleveland's invitation will be favorably considered and that we shall again have the pleasure of receiving in the Forest City the delegates of your noted Society, which has not so favored us in twenty-three years.

"Wishing you every success, we remain, respectfully,

"THE EXECUTIVE COMMITTEE OF THE CONVENTION BOARD,

"By ABRAHAM STEARN,

"Vice-President."

J. A. OCKERSON, M. Am. Soc. C. E.—I have presumed that the votes cast for St. Louis were largely on the supposition that the Exposition would be held there in 1903. Matters pending in Congress now look to a postponement until 1904, and at that time we hope to see the Society in St. Louis.

THE SECRETARY.—I also have some letters from another point. Shall I read them?

THE PRESIDENT.—Yes.

The Secretary then read the following letters from Birmingham, Ala.:

"BIRMINGHAM, ALA., June 19th, 1902.

"Mr. C. W. HUNT, Sec'y,

"American Society of Civil Engineers,

"Willard House, Washington, D. C.

"DEAR SIR.—The Mayor and Aldermen and the Commercial Club of this city have passed resolutions asking that the members of your organization use their influence to have your next annual meeting in 1903 held in Birmingham.

"Owing to the great developments that have been made during the past few years in industrial and engineering matters and the remarkable geological formation of this section, we think that we have many matters that would interest you.

"In extending this invitation to your association, I feel assured in saying that the hotel accommodations will be ample, and that large halls amply sufficient in which to hold your meetings will be furnished.

"As chief executive of this city, I have appointed Col. J. A. Montgomery of this city and other representatives from this district to use their utmost efforts to secure your next convention in 1903.

"Should you accept this invitation to come here, I most heartily assure you that a cordial welcome will be given and old fashioned Southern hospitality extended to you.

"Yours truly,

"W. M. DRENNEN,

"Mayor."

"BIRMINGHAM, ALA., May 17th, 1902.

"Secretary of American Society of Civil Engineers,

"Washington, D. C.

"DEAR SIR.—The Commercial Club of Birmingham, Ala., at a meeting held yesterday, passed a resolution most cordially inviting the American Society of Civil Engineers to hold its Convention for the year 1903 in the City of Birmingham.

"Our city and district have made such wonderful progress in the last decade that we feel sure that there are many things here which will interest the members of your body, and we would do everything in our power to make your stay here pleasant and agreeable.

"Very respectfully yours,

"J. B. GIBSON,
"Secretary."

"BIRMINGHAM, ALA., May 19th, 1902.

"MR. CHARLES WARREN HUNT,

"Sec'y, A. S. of C. E.,

"Washington, D. C.

"DEAR SIR.—At a meeting of the B'gham Section of the Engr. Ass'n of the South, the Secty. was directed to extend a cordial invitation to the American S'y of Civil Engrs. to hold their 1903 annual meeting in Birmingham, Ala., and assure you that a hospitable greeting will be tendered and every assistance given by the members of this Ass'n to make your visit an interesting one.

"Col. J. A. Montgomery was appointed to urge the acceptance of this invitation, he being a member I believe of the American S'y.

"Yours very truly,

"GEO. H. HARRIS,
"Sec'y."

THE PRESIDENT.—Gentlemen, the subject is open for your action.

BENJAMIN M. HARROD, Past-President, Am. Soc. C. E.—I move that the whole subject be referred to the Board of Direction.

Discussion on
Time and Place
for next
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The motion was duly seconded.

THE PRESIDENT.—Are there any remarks?

JACOB L. LUDLOW, M. Am. Soc. C. E.—It appears to me that our Board of Direction is very much overworked. They do a great deal of work for the Society, and this is something which the Society can decide for itself here at this meeting and not refer to the Board of Direction. We have invitations, both very cordial ones, from Cleveland and Birmingham. We cannot accept either one of those, for if we accept one the other will certainly feel hurt. It is very much like making a choice between two maidens, and taking one when you want them both. You can't have both. I propose to suggest a place which will relieve the necessity of a choice between those two, one which has not sent a formal invitation, because they were a little modest and hardly would expect to be honored by a visit of this Society to the locality which I shall mention. We were told yesterday by the gentlemen who graciously welcomed the Society that the engineers of America had accomplished about everything there was, real and tangible, in engineering science and skill. They did not tell us, however, of all the beautiful things which the engineer requires to mix up with his real work. There is a point in North Carolina which will inspire the gentlemen, members of this Society, with the broadest idea of the beautiful, the truly lovable, and would we adopt the aesthetic beauties of our profession we must study

Discussion on
Time and Place
for next
Convention
(continued).

the beautiful, and the one place east of the Rocky Mountains which the United States Government has been able to find which in any degree would rival the Yellowstone Park is in North Carolina. There all the beauties of Nature are to be seen from the porticos of the Battery Park Hotel. That hotel is just of sufficient size to accommodate the entire party that would attend the convention of the Society. The proprietor at some time in June will, I am sure—in fact, he has told me he would—turn over the entire hotel to this organization, so we can all be there together, ourselves, our wives and our sweethearts, boys and girls all together, where we can have a delightful time. Large halls to hold the business sessions, large dance halls, refreshments, and so forth. They would give us all the entertainment we want. We don't want to accept too much hospitality. As engineers, we are used to being pulled around, and we don't care to be pulled to St. Louis and thence from place to place. It is like a full man, he does not want too much meat, he wants something to drink. In Asheville, we can have the drink. There are mountains all around. There is the most magnificent piece of railroad building east of the Rocky Mountains, which you would enjoy in passing, and when you reach Asheville—I can't describe the beauties of it. But I arose to propose that this committee to-day be relieved of this work, and that just now this meeting select Asheville for the Convention in the month of June. I move, to amend the motion, that Asheville be selected as the place of meeting, in the month of June, 1903. (Applause.)

The motion was duly seconded.

A MEMBER.—I would like to second that motion, particularly as in wandering around through the members who are here now you find so many who are speaking of Cape May. Cape May didn't have any engineering features to show us, but we were all in one hotel together, and there were friendships formed there; and Asheville is a place finely located, a beautiful place, and Mr. Ludlow says it is a delightful place, and the hotel entirely capable of accommodating the Society.

A rising vote being taken on the amendment, the Secretary announced the vote as 59 for and 32 against.

THE PRESIDENT.—The amendment is carried. (Applause.)

THE PRESIDENT.—The action now comes upon the motion as amended.

A MEMBER.—What is that motion?

THE PRESIDENT.—This is an amendment. The original motion becomes now that this Society shall hold its next Convention at Asheville. That is now open for discussion.

MR. SEAMAN.—Mr. President, I would like to say I am with the majority in favor of going to Asheville, but I hesitate very much about making a precedent of this kind by which a gifted orator can stampede

the Convention. (Applause.) We know what that is in National politics.

MR. LUDLOW.—I object to any comparison with Mr. Bryan.

MR. SEAMAN.—I believe those remarks were taken down, and I know that they will be considered by the Board. I have every faith in the conservative action of the Board. I am strongly in favor of Asheville, but I hope we will not carry this motion at the present time.

MR. CROES.—I move that the matter be referred to the Board of Direction, with the statement it is the sense of this meeting that the Convention be held at Asheville.

THE PRESIDENT.—Do you move that as an amendment?

MR. CROES.—Yes.

The amendment was duly seconded.

THE PRESIDENT.—The amendment has been proposed, so that the wording be changed, that it is the sense of this meeting that the next Convention be held at Asheville. That is open for discussion.

MR. LUDLOW.—Isn't it the fact that the Board has the authority to fix the time and place, or is it only done through the action of the Convention?

THE SECRETARY.—It is done through the action of the Society.

MR. LUDLOW.—Then I understand the effect of the motion of the gentleman who has just spoken is, that this matter be referred to the Board with the power to fix the time and place, it being the sense of this meeting that the Convention be held in Asheville; is that the proposition?

THE PRESIDENT.—That will be the effect of it; that it be referred, with the statement that it is the sense of this meeting that it be held in Asheville.

MR. HARROD.—The amendment is accepted.

THE PRESIDENT.—The motion then stands that this matter be referred to the Board of Direction, it being the sense of this meeting that the next Convention should be held at Asheville.

GARDNER S. WILLIAMS, M. Am. Soc. C. E.—I rise to a point of order.

THE PRESIDENT.—What is the point?

MR. WILLIAMS.—The point being that the meeting has already amended the original motion, and therefore the original mover has no more control of it, to accept or refuse the amendment. The meeting is the only one to amend that motion.

THE SECRETARY.—I should like to have a definite ruling, for the purpose of our record as to what did happen about this Asheville resolution. The resolution was passed that the next Convention should be held at Asheville, North Carolina.

THE PRESIDENT.—That was an amendment of a pending motion, and that left the original motion to be put, and, pending the consideration of the original motion as amended, Mr. Croes' motion is made that it

Discussion on
Time and Place
for next
Convention
(continued).

be referred to the Board of Direction with the statement that it is the sense of this meeting that it be held at Asheville, and that is in the nature of an amendment of the original motion.

WILLIAM WATSON, M. Am. Soc. C. E.—Mr. President, I believe an original motion has been put and two successive amendments have been made. Now, if I make the motion for the previous question, the whole thing will come up on the original motion. I therefore move the previous question.

THE PRESIDENT.—I will direct the gentleman that the original amendment has not been put.

MR. WATSON.—It will cut off the two amendments; the motion I make is, that the previous question be put.

THE PRESIDENT.—The Chair hears no call for the previous question.

MR. G. S. WILLIAMS.—I want to say a word in regard to the amendment now pending before the Society, and in regard to the motion under consideration. It seems to me that while there is no doubt that there is a large sentiment in this room in favor of meeting in Asheville, in which I fully concur, it might not be right to tie up the Board of Direction by the passage of this resolution in the proposed amended form. Something might turn up, before the time comes for setting the Convention, which may lead to a more suitable choice elsewhere. I therefore feel that we might do better to simply refer this whole matter to the Board of Direction without any instructions, they knowing fully the sentiment which has been expressed here, and I, myself, feel that the Board of Direction would take all due cognizance of that sentiment and at the same time would be free to make other arrangements, if, for any reason, it should be desirable.

THE PRESIDENT.—That is a statement of fact.

MR. WILSON.—I want to add merely one more remark in agreement with the last speaker. Personally, I am very much in favor of Asheville. At the same time I do not like to see these precedents overruled, and those of us who were present at the Convention in Niagara will recall that there was a similar discussion as to our coming to Washington, and the matter was withdrawn and was left to go to the Board of Direction without instructions. I think it an admirable plan, and I hope that the members of this Convention in voting may see their way to vote with a view to leaving the whole matter to the Board of Direction without instructions. (Applause.)

MR. LUDLOW.—It appears that the sense of the meeting has been expressed, and Asheville is already selected. Of course, the gentlemen who did not vote for Asheville have in mind some other place, and they would like to leave the situation so that Asheville may be side-tracked. It is a pretty hard proposition, but I myself do not care to see any precedent broken in that way. I think the Board of Direction, if they prefer to perform these functions, should be allowed to do so. I don't

want to run counter to their wishes. If the gentleman who made the last amendment will simply make one change, I think those who didn't vote for Asheville will adopt this proposition, that the matter be referred to the Board of Direction without instructions, that it is the unanimous wish of this meeting assembled. (Laughter and applause.)

THE PRESIDENT.—The motion is upon Mr. Croes' amendment that this matter of the holding of the Annual Convention be referred to the Board of Direction, with the statement that it is the sense of this meeting that it shall be held in Asheville. Those who are in favor of that amendment will signify it by saying "aye."

The "ayes" having voted, the Chair announced the motion carried.

MR. WILSON.—Don't the "noes" get a chance? When the "noes" understand that these are instructions to the Board of Direction they will all vote on it.

THE PRESIDENT.—If the Chair failed to call the "noes" he was in error, and I now call for the "noes" on Mr. Croes' amendment that it be referred to the Board of Direction, with the statement that it is the sense of this meeting that it be held at Asheville. I will have to ask those in favor to stand up and be counted.

MR. WILSON.—I think there are a number who don't understand this.

THE PRESIDENT.—If amended it will stand as amended to be acted on then by the meeting as counted.

A rising vote being taken, it was announced 70 in favor and 14 against.

THE PRESIDENT.—The motion now stands as amended by Mr. Croes' motion, and is before the house.

The motion was put to vote and carried.

THE SECRETARY.—I am directed by the Board of Direction to report that the Board recommends that the Special Committee on Analysis of Iron and Steel, sub-committee of the American Society of Civil Engineers, of the International Committee on Standards for the Analysis of Iron and Steel, of which Professor J. W. Langley is Chairman, be discharged.

A motion to the above effect, being duly seconded, was carried, and the President declared the Committee discharged.

THE SECRETARY.—The Board recommends that the Special Committee on Units of Measurements be discharged.

The motion, being duly seconded, was carried, and the President announced the Committee discharged.

MR. WILLIAMS.—I want to call attention to one little omission which it seems to me should be corrected, reviewing the proceeding on this question of referring the matter to the Board of Direction. We have amended the motion, but we have not yet adopted the motion as amended.

Special Committee on Analysis of Iron and Steel Discharged.

Special Committee on Units of Measurement Discharged.

THE PRESIDENT.—I think we did do that.

THE SECRETARY.—The railroad representative here who has viséd the certificates tells me that if the members of the Society should go in bunches of ten or fifteen, or even five, to the station to get their tickets on the certificate plan for the return, they probably would lose several trains before they could purchase them, and that therefore it is necessary for them to attend to the purchase of return tickets as early as possible on the day of departure, and that the best places to handle that business are the uptown ticket offices in the neighborhood of the Treasury Department.

A MEMBER.—Must that be on the day of departure?

THE SECRETARY.—Unless you leave early in the morning.

Adjourned.

EXCURSIONS AND ENTERTAINMENTS DURING THE THIRTY-FOURTH ANNUAL CONVENTION.

The arrangements for the Convention were in the hands of the following Committees:

Committee of the Board of Direction.

MORDECAI T. ENDICOTT, *Chairman.*

GEORGE H. PEGRAM,	CHAS. WARREN HUNT.
-------------------	--------------------

Local Committee.

GEORGE W. MELVILLE, *Chairman.*

JOHN BIDDLE,	CONWAY B. HUNT,
WILLIAM M. BLACK,	DAVID E. MCCOME,
DAVID S. CARLL,	ALEXANDER MACKENZIE,
BERNARD R. GREEN,	ALEXANDER M. MILLER,
HERBERT M. WILSON.	

By the courtesy of the Pennsylvania Railroad a special train was made up for members of the Society and their guests, to run from New York to Washington. This train left Jersey City at 1.14 p. m. on Monday, May 19th, made stops at Newark, Trenton, Philadelphia and Baltimore, and arrived in Washington at 6.10 p. m.

The Pennsylvania Railroad made a special rate of a single fare for the trip to Washington and return. By arrangement with the Trunk Line Passenger Association, a rate of one and one-third fare was secured for all who attended the Convention.

In the afternoon of Tuesday, May 20th, through the courtesy of the Washington Railway and Electric Company, a large party of members and guests made an excursion to Cabin John Bridge, the return trip being made by way of Chevy Chase.

The illustrated talks, descriptive of various engineering features in Washington and vicinity, delivered by several of the local members, during the evening of Tuesday, May 20th, formed one of the most interesting and instrnctive features of the Convention.

On Wednesday, May 21st, at 9.45 A. M., the members of the Society were received at the White House by the President of the United States.

During the afternoon of Wednesday, May 21st, a large party of members and guests visited the Washington Navy Yard, where every opportunity for inspecting the gun factory, towing tank and apparatus for testing ship models was furnished. During the visit a jacket was shrunk on a 12-in. gun.

On Thursday, May 22d; a party of about 600 members and guests visited the Washington Barracks and witnessed an exhibition of pontoon bridge building by the Engineers' School and Battalion.

Immediately thereafter the party boarded the Steamer *Macalester* and sailed down the Potomac to Fort Washington, where the operation of the 10-in. guns on disappearing carriages was described, and a gun fired. Again taking the steamer, the party proceeded to Marshall Hall, where a planked-shad dinner was served.

After dinner, Mt. Vernon was visited. After inspecting the house and grounds, the party listened to an interesting address on George Washington as a Surveyor and Civil Engineer, by Herbert M. Wilson, M. Am. Soc. C. E. The party reached Washington at 5.30 P. M.

In the evening, commencing at 9.30 P. M., an informal dance in the ballroom of the Willard was enjoyed by a large number.

On Friday, May 23d, parties were conducted by the local members to a number of points of engineering and general interest, among them being the Capitol, Library of Congress, Washington Monument, National Museum, Geological Survey, Coast Survey, War Department, National Cemetery, etc.

Upon the invitation of the Trustees of the Corcoran Gallery of Art a reception was held at the Gallery in the evening from 8 to 11.

THE ATTENDANCE AT THE THIRTY-FOURTH ANNUAL CONVENTION.

The following 343 members were in attendance:

Abbott, F. V.	Washington, D. C.	Carll, David S.	Washington, D. C.
Abert, S. T.	Washington, D. C.	Carter, Shirley	Richmond, Va.
Ackermann, E. R.	New York City	Carter, William J.	Cleveland, Ohio
Adams, Raymond E.,	Washington, D. C.	Catt, George W.	New York City
Aiken, W. A.	Pittsburg, Pa.	Chambers, F. T.	Philadelphia, Pa.
Allen, C. H.	New York City	Chapin, L. E.	Canton, Ohio
Allen, Henry C.	Syracuse, N. Y.	Chase, R. D.	New York City
Allen, James P.	Charleston, S. C.	Chester, J. N.	Pittsburg, Pa.
Allen, Kenneth	Baltimore, Md.	Churchill, Chas. S.	Roanoke, Va.
Allen, William A.	Maurer, N. J.	Clark, L. V.	Philadelphia, Pa.
Andrews, Horace	Albany, N. Y.	Cedwise, Edward B.	Kingston, N. Y.
Asserson, P. C.	Brooklyn, N. Y.	Codwise, H. R.	Brooklyn, N. Y.
Aus, Gunwald	New York City	Coffin, Amory	New York City
Averill, F. L.	Washington, D. C.	Cohen, Mendes	Baltimore, Md.
Aylett, P.	Portsmouth, Va.	Cook, John H.	Paterson, N. J.
Babb, C. C.	Washington, D. C.	Connor, E. H.	Leavenworth, Kans.
Bacon, J. W.	Danbury, Conn.	Corthell, A. B.	New York City
Baldwin, F. H.	Bayonne, N. J.	Craighill, William P.	Washington, D. C.
Barnsley, George T.	Oakmont, Pa.	Crane, Albert S.	Sault Ste. Marie, Ont., Canada
Bassett, G. B.	Buffalo, N. Y.	Croes, J. J. R.	New York City
Bates, Onward	Chicago, Ill.	Creuzbaur, R. W.	New York City
Belknap, W. E.	New York City	Crowell, F.	New York City
Benzenberg, G. H.	Milwaukee, Wis.	Cummings, Robert A.	Pittsburg, Pa.
Bergengren, F.	Harrisburg, Pa.	Dalrymple, F. W.	Jamestown, N. Y.
Berle, K.	Washington, D. C.	Darrach, C. G.	Ridley Park, Pa.
Berthelet, J. R.	Milwaukee, Wis.	Davis, Arthur P.	Washington, D. C.
Biddle, John	Washington, D. C.	Davis Charles	Allegheny, Pa.
Black, William M.	Washington, D. C.	Davis, Harold	Washington, D. C.
Boller, A. P.	New York City	Davidson, George S.	Pittsburg, Pa.
Boller, A. P., Jr.	Brooklyn, N. Y.	Dean, Luther	Taunton, Mass.
Bolton, Channing M.	Rio, Va.	Deans, John S.	Phoenixville, Pa.
Bouscaren, G.	Cincinnati, Ohio	Dennis, W. F.	Richmond, Va.
Braine, L. F.	Newark, N. J.	Douglas, E. M.	Washington, D. C.
Breithaupt, W. H.,	Berlin, Ont., Canada	Drake, A. B.	New Bedford, Mass.
Brendlinger, P. F.	Narberth, Pa.	Dunham, H. F.	New York City
Bryson, Andrew	Reading, Pa.	Dunn, E. C.	Alexandria, Va.
Buchholz, C. W.	New York City	Easby, M. Ward	Philadelphia, Pa.
Burr, Edward	Washington, D. C.	Ellis, John W.	Woonsocket, R. I.
Card, W. W.	Pittsburg, Pa.	Endicott, Mordecai T.	Washington, D. C.
Carlile, T. J.	Philadelphia, Pa.		

- Engle, R. L. Cincinnati, Ohio
Erlandsen, Oscar New York City
Evans, M. E. New York City
- Fendall, B. T. Baltimore, Md.
Fiebeger, G. J. West Point, N. Y.
Fisher, Edwin A. Rochester, N. Y.
Fitch, C. H. Washington, D. C.
Flad, Edward. St. Louis, Mo.
Flynn, Benjamin H. Columbus, Ohio
Folwell, A. Prescott Easton, Pa.
Francis, Charles Davenport, Iowa
Freeman, Frank L. Washington, D. C.
Freyhold, Felix Washington, D. C.
Frink, E. A. Baltimore, Md.
Fuller, George W. New York City
Fuller, William B. Paterson, N. J.
Furber, W. C. Philadelphia, Pa.
- Gahagan, W. H. Brooklyn, N. Y.
Garrison, F. L. Philadelphia, Pa.
Gartensteig, Charles. New York City
Gates, Christopher L. Toledo, Ohio
Gerig, William Memphis, Tenn.
Gifford, George E. New York City
Goad, C. E. Montreal, Que., Canada
Goldsbrough, J. B.,
 Croton-on-Hudson, N. Y.
Goodell, J. M. Worcester, Mass.
Gowen, Charles S. Ossining, N. Y.
Grafton, C. E. Akron, Ohio
Graham, J. M. Baltimore, Md.
Grantham, Herbert T.,
 Philadelphia, Pa.
Gray, Samuel M. Providence, R. I.
Green, Bernard R. Washington, D. C.
Greene, Charles E. Ann Arbor, Mich.
Greiner, John E. Baltimore, Md.
Griggs, Julian. Columbus, Ohio
Guthrie, Edward B. Buffalo, N. Y.
- Hanna, John H. Washington, D. C.
Hansel, Charles. New York City
Harper, Isaac O. Baltimore, Md.
Harrington, F. F. Brooklyn, N. Y.
Harris, C. M. New York City
Harrison, E. W. Jersey City, N. J.
Harrod, B. M. New Orleans, La.
Hartranft, W. G. Philadelphia, Pa.
Hatton, T. Chalkley,
 Wilmington, Del.
Haupt, L. M. Philadelphia, Pa.
Hayes, Edward. Cohoes, N. Y.
Hayford, J. F. Washington, D. C.
Hazen, Allen. New York City
Hazlehurst, J. N. Mobile, Ala.
Hendricks, V. K. Indianapolis, Ind.
Hering, Rudolph. New York City
Herschel, Clemens. New York City
Hickok, H. A. Newark, N. J.
Hider, Arthur. Greenville, Miss.
Hildenbrand, W. New York City
Hill, E. A. Washington, D. C.
Hodgdon, Frank W. Boston, Mass.
Honens, Fred W. Sterling, Ill.
Horton, Horace E. Chicago, Ill.
Horton, Theodore. New York City
Hovey, O. E. Pencoyd, Pa.
Howe, Horace J. New York City
Howell, D. J. Washington, D. C.
Hughes, W. M. Chicago, Ill.
Humphreys, Richard L.
 Philadelphia, Pa.
Hunt, Charles Warren. New York City
Hunt, Conway B. Washington, D. C.
Hunt, Robert W. Chicago, Ill.
Hutton, N. H. Baltimore, Md.
Hyde, Charles G. Philadelphia, Pa.
- Ingalls, O. L. Washington, D. C.
- Johnson, A. L. St. Louis, Mo.
Johnson, J. M. Louisville, Ky.
Johnson, Lewis E. Steelton, Pa.
Johnson, L. J. Cambridge, Mass.
Jordan, E. C. Portland, Me.
Judson, William Pierson
 Oswego, N. Y.
Judson, W. V. Washington, D. C.

Kenney, E. F.	Philadelphia, Pa.	Marburg, Edgar ..	Philadelphia, Pa.
Khuen, H., Jr.	Pittsburg, Pa.	Marden, Walter R.	Philadelphia, Pa.
Kimball, George A.	Boston, Mass.	Marple, William M.	Scranton, Pa.
King, Paul S.	New York City	Matcham, Charles A.	Allentown, Pa.
Kingsley, M. W.	Cleveland, Ohio	Matthes, Gerard H.	Washington, D.C.
King, W., Jr.	New York City	Maxwell, J. R.	Newark, Del.
Knap, J. M.	New York City	Mead, Elwood	Washington, D. C.
Knowles, Morris	Pittsburg, Pa.	Melville, George W.	
Kuichling, Emil ...	Rochester, N. Y.		Washington, D. C.
Kutz, C. W.	Washington, D. C.	Marindin, H. L.	Washington, D. C.
La Chicotte, H. A.	New York City	Meyer, Henry C., Jr.	New York City
Latrobe, C. H.	Baltimore, Md.	Miller, Alexander M.	
Latta, Harrison W.	Philadelphia, Pa.		Washington, D. C.
Leisen, Theodore A.	Wilmington, Del.	Miller, Spencer	New York City
Leland, W. A.	Columbia, S. C.	Mills, Charles M.	Philadelphia, Pa.
Leonard, H. R.	Philadelphia, Pa.	Montfort, Richard	Louisville, Ky.
Lepper, Fred W.	Washington, D. C.	Montgomery, J. A.	Birmingham, Ala.
Lesley, R. W.	Philadelphia, Pa.	Moore, Charles H.	New York City
Lewerenz, A. C.	Washington, D. C.	Moore, Robert	St. Louis, Mo.
Linton, Harvey	Altoona, Pa.	Mordecai, A.	Cleveland, Ohio
Livingston, J. I.	Bound Brook, N. J.	Morse, C. M.	Buffalo, N. Y.
Lockwood, Willard D.	Baltimore, Md.	Mosman, A. T.	Washington, D. C.
Long, E. McL.	New York City	Munroe, Hersey.	Washington, D. C.
Looker, H. B.	Washington, D. C.	Myers, E. T. D., Jr.	Richmond, Va.
Loomis, Horace.	New York City	Neumeyer, R. E.	Bethlehem, Pa.
Loree, L. F.	Baltimore, Md.	Newell, F. H.	Washington, D. C.
Low, George E.	New York City	Nicolson, G. L.	Washington, D. C.
Loweth, C. F.	Chicago, Ill.	Noble, Alfred	New York City
Lowinson, Oscar.	New York City	North, Edward P.	New York City
Ludlow, J. L.	Winston, N. C.	Norton, A. G.	Wheeling, W. Va.
Lum, D.	Washington, D. C.	Ockerson, J. A.	St. Louis, Mo.
Lusk, J. L.	Washington, D. C.	O'Rourke, John F.	New York City
Lynch, T. D.	Pittsburg, Pa.	Owen, James	Newark, N. J.
Lyon, W. C.	Washington, D. C.	Pardee, James T.	Cleveland, Ohio
McCalla, R. C.	Tuscaloosa, Ala.	Parker, A. McC.	New York City
McCann, Thomas H.	Hoboken, N. J.	Parmley, W. C.	Cleveland, Ohio
McComb, David E.	Washington, D. C.	Parsons, A. L.	Washington, D. C.
McKenney, C. A.	Washington, D. C.	Pegram, George H.	New York City
Mackenzie, Alexander		Pence, W. D.	Lafayette, Ind.
		Perrilliat, Arsène.	New Orleans, La.
		Peterson, P. A.	
			Montreal, Que., Canada
McKenzie, T. H.	Southington, Conn.	Pew, Arthur.	Bainbridge, Ga.
McKinstry, C. H.	Washington, D. C.	Phillips, A. E.	Washington, D. C.
McLain, L. R.	St. Augustine, Fla.	Pinchot, Gifford.	Washington, D. C.
MacLennan, John D.	Cleveland, Ohio	Polk, William Anderson,	
McMinn, Thomas J.	New York City		New York City
Maignen, J. P. A.	Philadelphia, Pa.		
Manley, Henry.	Boston, Mass.		

Pollock, C. D.....	Brooklyn, N. Y.	Thackray, George E..	Johnstown, Pa.
Pierce, William T.....	Boston, Mass.	Theban, J. G.....	New York City
Potter, Alexander.....	New York City	Thomas, George E..	Annapolis, Md.
Powell, A. V.....	Chicago, Ill.	Thompson, Benjamin,	
Pratt, William Arthur,	Philadelphia, Pa.		Chattanooga, Tenn.
Pressey, H. A.....	Washington, D. C.	Thompson, W. A...	Washington, D. C.
Prout, H. G.....	New York City	Tinkham, S. E.....	Boston, Mass.
Quick, Alfred M.....	Baltimore, Md.	Trantwine, John C., Jr.,	
Ramsey, Edmund P....	Brooklyn, N. Y.		Philadelphia, Pa.
Reed, W. Boardman...	New York City	Tullock, A. J....	Leavenworth, Kans.
Reynders, J. V. W....	Harrisburg, Pa.	Turner, E. K.....	Boston, Mass.
Richards, J. T.....	Philadelphia, Pa.	Ulrich, Daniel.....	New York City
Richardson, T. F.....	Clinton, Mass.	Van Horne, John G...	New York City
Riggs, M. J.....	Toledo, Ohio	Vredenburgh, Watson, Jr.,	
Ripley, T. M.....	Marietta, Ohio		New York City
Rommel, George, Jr.,	Wilmington, Del.	Wagner, J. C.....	Philadelphia, Pa.
Rousseau, H. H...	Washington, D. C.	Wagner, S. T.....	Philadelphia, Pa.
Russell, S. Bent.....	St. Louis, Mo.	Wallace, W. M....	Washington, D. C.
Ryder, Ely M. T..	New Haven, Conn.	Warman, F. C....	Washington, D. C.
Sabin, A. H.....	New York City	Watkins, J. E.....	Washington, D. C.
Schaub, J. W	Chicago, Ill.	Warder, J. H	Chicago, Ill.
Sehermerhorn, L. Y.,	Philadelphia, Pa.	Watson, William.....	Boston, Mass.
Schmitt, Ewald...	Washington, D. C.	Webster, G. S.....	Philadelphia, Pa.
Schneider, C. C	New York City	Webster, William R.,	Philadelphia, Pa.
Seaman, Henry B....	New York City	Wegmann, E.....	Katonah, N. Y.
Shirreffs, Reuben....	Richmond, Va.	Weller, Francis R.	Washington, D. C.
Sluryock, Joseph G.	Philadelphia, Pa.	Wentworth, C. C.....	Roanoke, Va.
Smith, J. Waldo.....	Paterson, N. J.	Weston, R. S.....	Boston, Mass.
Smith, Oberlin...	Bridgeport, N. J.	Whelpley, J. R...	Washington, D. C.
Soper, G. A	New York City	Whistler, John T .	Washington D. C.
Sperry, H. M.....	New York City	Whitcomb, H. D....	Richmond, Va.
Stauffer, D. McN....	New York City	White, F. G	New York City
Stern, E. W.....	New York City	Whitted, L. R	Norfolk, Va.
Swain, George F.....	Boston, Mass.	Whittemore, W. F....	Hoboken, N. J.
Sweet, Elnathan.....	Albany, N. Y.	Whitson, Abraham U.,	College Point, N. Y.
Sweitzer, N. B....	Washington, D. C.	Wilcock, Frederick...	Brooklyn, N.Y.
Swensson, Emil.....	Pittsburg, Pa.	Wilkins, W. G.....	Pittsburg, Pa.
Taber, George A.....	New York City	Wiley, W. H.....	New York City
Tait, John G.....	New York City	Williams, Gardner S ...	Ithaca, N. Y.
Tenney, George O.,		Wills, A. J	Harrisburg, Pa.
Spartanburg, S. C.		Wilson, C. A.....	Cincinnati, Ohio
Thacher, Edwin.....	New York City	Wilson, H. M....	Washington, D. C.
		Wilson, Percy H...	Philadelphia, Pa.

Wisner, George Y.....	Detroit, Mich.	Yonge, Samuel H....	Richmond, Va.
Wölfel, Paul L.....	Pencoyd, Pa.	Zeller, A. H.....	St. Louis, Mo.
Worcester, J. R.....	Boston, Mass.	Zipperlein, Joseph W.,	
Worthington, Charles..	Pittsburg, Pa.	Philadelphia, Pa.	
Wright, M. H.....	Nashville, Tenn.		

The total registered attendance at the Convention was as follows:

Members of the Society, in all grades.....	343
Guests, including ladies.....	377
Total.....	720

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, September 3d, 1902.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and a paper by R. C. McCalla, M. Am. Soc. C. E., entitled "Improvement of the Black Warrior, Warrior and Tombigbee Rivers, in Alabama," will be presented for discussion.

This paper was printed in the *Proceedings* for April, 1902.

Wednesday, September 17th, 1902.—8.30 p. m.—At this meeting, a paper by James N. Hazlehurst, M. Am. Soc. C. E., entitled "The Maintenance of Asphalt Streets," will be presented for discussion.

This paper was printed in the *Proceedings* for May, 1902.

Wednesday, October 1st, 1902.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and a paper by Theron A. Noble, M. Am. Soc. C. E., entitled "The Flow of Water in Wood Pipes," will be presented for discussion.

This paper is printed in this number of *Proceedings*.

Wednesday, October 15th, 1902.—8.30 p. m.—At this meeting, a paper, entitled "The Protection and Improvement of Foreshores by the Utilization of Tidal and Wave Action," by R. G. Allanson-Winn, M. Inst. C. E., I., will be presented for discussion.

This paper is printed in this number of *Proceedings*.

ACCESSIONS TO THE LIBRARY.

From May 7th to August 5th, 1902.

DONATIONS.*

ELECTRIC POWER TRANSMISSION.

A Practical Treatise for Practical Men. By Louis Bell, M. Am. Inst. E. E. Third Edition, Revised and Enlarged. Cloth, $9\frac{1}{2} \times 6\frac{1}{2}$ ins., 632 pp., illus., 21 plates. New York, Electrical World and Engineer, 1901. \$3.00.

This volume is designed to set forth in the simplest possible manner the fundamental facts concerning present practice in electrical transmission. The author has endeavored, in introducing such theoretical considerations as are necessary, to explain them in the most direct way practicable, using proximate methods of proof and stating only the results of investigation when the processes are complicated. In order to bring the present edition up to date it became necessary almost to rewrite some of the chapters, adding considerable amounts of new matter and many illustrations of recent plants and apparatus. A brief chapter on commercial electrical measurements has been added, and a final chapter on the present state of high voltage transmission has been utilized to bring the latest developments of the art before the reader. The contents are: Elementary Principles; General Conditions of Power Transmission; Power Transmission by Continuous Currents; Some Properties of Alternating Circuits; Power Transmission by Alternating Currents; Synchronous and Induction Motors; Current Reorganizers; Engines and Boilers; Water Wheels; Hydraulic Development; The Organization of a Power Station; The Line; Line Construction; Centers of Distribution; The Commercial Problem; The Measurement of Electrical Energy; The Present State of High Voltage Transmission. There is an index of six pages.

THE MECHANICS OF ENGINEERING.

Volume II. The Stresses in Framed Structures, Strength of Materials and Theory of Flexure; also the Determination of Dimensions and Designing of Details, Specifications, Complete Designs and Working Drawings. By A. Jay Du Bois. Cloth, $11\frac{1}{2} \times 8$ ins., 23 + 609 pp., illus., 28 plates. New York, John Wiley & Sons, 1902. \$10.00.

The present (twelfth) edition of the author's "Stresses in Framed Structures" is issued as Vol. II of "The Mechanics of Engineering," of which Vol. I has already appeared. The present volume is complete in itself. The entire work has been revised, although but few changes from the last edition have been made. The contents are: Part I. Different Methods of Calculation; Practical Application of Preceding Methods to Various Structures; Part II. Determination of Dimensions and Designing of Details. There is an index of seven pages.

METALLURGY OF CAST IRON.

A Complete Exposition of the Processes Involved in its Treatment, Chemically and Physically, from the Blast Furnace through the Foundry to the Testing Machine. A Practical Compilation of Original Research. By Thomas D. West. Sixth Edition. Cloth, 7×5 ins., 20 + 627 pp., illus. Cleveland, The Cleveland Printing and Publishing Co., 1902. \$3.00. (Donated by the author.)

This work is written with a view to its value not only to the founder, the moulder, the blast-furnace man, the chemist and the engineer, but also to the designer, the draftsman, the pattern maker, the college specialist and all who may in any manner be desirous of obtaining a practical knowledge of cast iron in its application to founding or any allied interests. In compiling this volume, the author has been guided by a broad experience as a moulder and founder in loam, dry and green sand, and in the various specialties of founding. The work has been extensively revised, and much new matter on making, mixing, melting and testing cast iron has been added. Part I treats of Man-

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

ufacture and Use of Coke; Properties in Ores; Operations of Blast Furnaces; The Different Brands of Pig Iron and How to Purchase and Use Them Intelligently. Part II treats of Elements in Cast Iron and Their Physical Effects; Utility of Chemical Analyses and How to Use Them in making the Different Mixtures of Irons Used in making Gray and Chilled Castings. Part III treats of Properties of and Methods for Testing Molten Iron; Discloses Phenomena in the Actions of Cooling Metal, etc.; Presents Results of Tests in All Kinds of Irons, and the Best Methods for Testing. There is an index of thirty-three pages.

ANNUAL STATISTICAL REPORT OF THE AMERICAN IRON AND STEEL ASSOCIATION.

Containing Complete Statistics of the Iron and Steel Industries of the United States for 1901 and Preceding Years. Paper, 9 $\frac{1}{2}$ x 6 ins., 64 pp. Philadelphia, American Iron and Steel Association, 1902. \$3.00.

This work gives full details of the production of iron ore and the various forms of iron and steel in the United States in 1900, and immediately preceding years, the shipments of iron ore from the Lake Superior and other mines, the imports of Cuban and other iron ore, the production of coal and coke, the imports and exports of iron and steel and coal and coke, the production of manganese ore, the prices of Lake Superior iron ore, the prices of iron and steel, the tonnage of iron and steel vessels built in 1900 and 1901, immigration in 1900, etc.

Forming a part of the report is a paper, prepared for the United States Geological Survey, which is devoted to a review of the progress made by the world's iron and steel industries down to the close of the Nineteenth Century. A feature of this paper is a chronological record of the development of the iron and steel industries of the United States from 1619 to 1900, giving the principal events in that development and a summary of the results.

THE EVOLUTION OF MINE-SURVEYING INSTRUMENTS.

By Dunbar D. Scott and Others. Comprising the Original Paper of Mr. Scott on the Subject, together with the Discussion thereof, and Independent Contributions on the Subject. Cloth, 9 x 5 ins., 324 pp., illus. New York City, American Institute of Mining Engineers, 1902. \$3.50.

In this volume the Secretary of the Institute has gathered the several papers and discussions on mine-surveying instruments which have been contributed to the recent volumes of the *Transactions*. The preface states that "the subject will never be exhausted. It is believed, nevertheless, that the material here presented comprises in compact and convenient form information of sufficient scope and value to warrant the issue of the book by the Institute."

THE MUNICIPAL YEAR BOOK, 1902.

Giving the Population, Assessed Valuation, Principal Officials and Ownership of Public Utilities; also information regarding the Water Supply, Sewerage, Street Cleaning, Street Sprinkling, Garbage, Fire and Underground Electric Service in all Incorporated Places in the United States, and in all New England Towns of 3 000 Population and Upwards by the Censuses of 1900. With Summaries and Editorial Discussion. Edited by M. N. Baker. Cloth, 9 x 6 ins., 54 + 310 pp. New York, The Engineering News Publishing Company, 1902. \$3.00.

This book combines a directory of municipal officials and franchise companies, an exhibit of municipal and private ownership, and an outline of the leading public works and services in each of the 1,524 largest municipalities of the country. The preface states that never before has there been presented so complete an exhibit of the relative extent of municipal and private ownership. This information is first given alphabetically by States, together with other facts relating to the various cities and towns. It is next presented alone, in compact tabular form, with cities arranged in order of population, from Greater New York, with 3,437,202 to Rice Lake, Wis., with 3,002 inhabitants. Various summaries, by geographical location and by population, follow.

HANDBOOK FOR STREET RAILWAY ENGINEERS.

Containing Geometrical and Trigonometrical Formulae, Transition Curve Tables, Track Construction Tables, Strength of Wooden Beams and Columns, Electrical Formulae and Tables, and much other Infor-

mation Invaluable in Street-Railway Design and Maintenance. By H. B. Andrews. Leather, 5 x 3 ins., 202 pp., plates. New York, John Wiley & Sons, 1902.

In preparing this book, it has been the desire of the author to present in compact form a collection of tables and information particularly suitable for use by engineers connected with street railways. The author, during his connection with the Boston Elevated Railway Company for the past eleven years, has computed and tabulated much of the information given. The remainder has been compiled from various sources, selecting only that which would be of the most practical value in every-day work. All tables, diagrams, formulas, etc., have been carefully verified, and it is believed they are free from errors of any magnitude. The chapter headings are: Mensuration—Trigonometrical Formulae; Circular Curves; Compound Transition Curves; Plan Curves; Miscellaneous Information; Bending Moments, Strength of Materials; Data for Estimates; Electrical Information; Aluminum for Electrical Conductors; The Storage Battery; Tables; Relative Percentages of Expenditures to Gross Receipts for Street Railways in Massachusetts; Buyer's Directory.

PRINCIPLES OF SANITARY SCIENCE AND PUBLIC HEALTH.

With Special Reference to the Causation and Prevention of Infectious Diseases. By William T. Sedgwick. Cloth, 9 x 6 ins., 19 + 368 pp., plates. New York, The Macmillan Company, 1902. \$3.00.

This volume is a direct outgrowth of a course of lectures on Sanitary Science and Public Health, given for several years by the author to certain senior students of the Massachusetts Institute of Technology, and it has been prepared primarily for their use. It is believed, however, that a larger circle of students and some physicians, publicists and general readers may be glad to have access to the same material. The author states that the volume deals with principles, rather than the arts, of sanitation; nor is it based upon lectures given to beginners. It is intended to be no more than an elementary treatise on the subject; and while it is believed that it contains some new material, and some old material treated from new points of view, no special claim is made for originality either in substance or in method of presentation. The author has chiefly sought to bring together and present in a simple and logical form those fundamental principles on which the great practical arts of modern sanitation securely rest. The chapter headings are: On Health, Old Age and Disease; On Etiology or Causes of Disease; On the Rise and Influence of Bacteriology; Sanitary Aspect of the Struggle for Existence; On Infection and Contagion; On Dirt and Disease; On Sewage as a Vehicle of Infectious Disease; On Water as a Vehicle of Infectious Disease; On the Establishment and Conservation of Purity of Public Water Supplies; On Ice as a Vehicle of Infectious Disease; On Milk as a Vehicle of Infectious Disease; On Certain Uncooked Foods as Vehicles of Infectious Disease; On the Prevention and Inhibition of Infection, Decomposition and Decay; On the Destruction or Removal of Infection; On Some Popular Beliefs as to Certain Special and Peculiar Causes of Disease. There is an index of six pages.

SEWAGE WORKS ANALYSES.

By Gilbert J. Fowler. Cloth, 7½ x 5½ ins., 6 + 135 pp., illus. New York, John Wiley & Sons, 1902. \$2.00.

This book has been written in response to several requests for an account of the methods of analysis in use in the laboratory of the Manchester Corporation Sewage Works. The author has also been able to include descriptions of some of the more important processes employed in the laboratory of the Mersey and Irwell Joint Committee. The preface states that, in general, the Joint Committee's methods are designed for cases where samples from different works have to be critically examined, the Manchester methods for the analysis of a large number of samples of sewage and effluents of the same general character. It is believed that the methods here described are such as a considerable experience has shown to be capable of being rapidly executed, and of giving results of an accuracy amply sufficient for practical requirements. The Contents are: The Chemical Control of Sewage Purification Processes; The Determination of Absorbed Oxygen; The Determination of Ammonia; The Determination of Nitrites and Nitrates; The Determination of Dissolved Oxygen; The Determination of Chlorine, Acidity and Alkalinity, and Iron Compounds; The Determination of Solids in Solution and Suspension; The Analysis of Gases from the Septic Tank and from Bacterial Filters; Tables. There is an index of two pages.

STEAM HEATING AND VENTILATION.

By William S. Monroe, M. Am. Soc. M. E. Cloth, 9½ x 6 ins., 146 pp., illus. New York, The Engineering Record, 1902. \$2.00.

It has been the aim of the author, in this work, to present briefly the theoretical considerations involved in the design of heating and ventilating plants, and to compile the best of the large array of empirical formulas and data in a way that will be of value to

those interested in the current practice of the art. The Contents are: Steam Heating; Systems of Piping and Steam Supply; Steam Heating Apparatus; Indirect Radiators; Design of Radiation; Piping and Construction Details; Mechanical Ventilation—General Principles; Systems of Mechanical Ventilation; Ventilating Ducts; Ventilating Fans; Heaters and Other Apparatus. There is an index of three pages.

LA CONSTRUCTION EN CIMENT ARMÉ.

Applications Générales, Théories et Systèmes Divers. Par C. Berger et V. Guillerme. Préface de E. Candlot. 2 vol. Paper, 10 x 6½ ins. (Atlas 12 x 9½). Paris, Ch. Dunod, 1902. 40 francs.

The authors have endeavored in this work to impart information concerning the principles and advantages of "ciment armé," the different systems advocated, the judicious use of materials, etc. They believe that the exposition of theories and methods of calculation, the description of the processes of execution and their many applications, together with the numerous drawings and detailed designs, make this book a practical treatise, interesting alike to the theorist, the engineer and the architect. The contents are: Chaux et Ciments; Le Ciment Armé; Méthodes et Procédés Divers.

NEUERE BAUWEISEN UND BAUWERKE AUS BETON UND EISEN.

III. Theil, Fortsetzung des Berichtes über den Stand bei der Pariser Ausstellung aus dem Gebiete des Wasserbaues; Der Expertenbericht über den Hauseinsturz in Basel. IV. Theil. Die Durchbiegung und Einspannung von armierten Betonbalken und Platten. Von Fritz von Emperger. Paper, 14 x 10 ins., 55 pp., illus. Wien, Lehmann & Wentzel, 1902.

WATER-SUPPLY.

(Considered Principally from a Sanitary Standpoint.) By William P. Mason. Third Edition, Rewritten. Cloth, 9 x 6 ins., 7 + 448 pp., illus., maps. New York, John Wiley & Sons, 1902. \$4.00.

The preface states that as so much material has been added to the stock of general knowledge upon the subject of "Water-supply" since the appearance of the last edition of this book it was found necessary to rewrite large portions of the original text. The chapters upon the "Chemical and Bacteriological Examination of Water" have been omitted, for the reason that they have been published separately in book form for the more convenient use of students. Under Filtration will be found a full account of the workings of the new plants at both Albany and Ashland, together with statistics illustrating the results of such filtration upon typhoid death-rates. Considerable new material will be found under the subject of Mechanical Filtration, including a discussion of the new iron coagulant and also the influence of sedimentation-basins when the filter is running upon soft water. Space is also given to a discussion as to the merits of the rival systems of filtration, American and English, and to the question of properly choosing between them for municipal filtration. Purification of water by freezing and underground storage are largely dealt with. All statistical tables are carried up to date and many new illustrations are given. The chapter headings are: Introductory; Drinking-Water and Disease; Artificial Purification of Water; Natural Purification of Water; Rain, Ice and Snow; River and Stream-Water; Stored Water; Ground-Water; Deep-Seated Water; Quantity of Per Capita Daily Supply; Action of Water upon Metals; Analyses of City Water-Supplies; Typhoid-Fever Death-Rates for American Cities; Typhoid-Fever Statistics for American and European Cities; Effects of Contaminated Waters upon Fish; Water for Industrial Purposes; Liquids Deemed Polluting by English River Pollution Commission; Use of Sea-Water for Street-Washing, Sewer-Flushing, etc. There is an index of twenty-two pages.

DIAGRAMS OF MEAN VELOCITY OF UNIFORM MOTION OF WATER IN OPEN CHANNELS.

Based on the Formula of Ganguillet and Kutter. Prepared by Irving P. Church, C. E. Paper, 9½ x 12½ ins., unpage. New York, John Wiley & Sons, 1902. \$1.50.

This is a set of eleven diagrams for different values of n , from 0.009 to 0.025, and ranging from 0.1 ft. to 25 ft. in the value of R , the hydraulic radius; the slope varying from 0.01 ft. to 100 ft. per thousand (that is, from $S = 0.00001$ to $S = 0.100$). "Such being the range of application, covering all ordinary cases in practice, it is thought that these diagrams constitute a fairly comprehensive 'bird's eye view' of Kutter's useful formula."

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The Manufacturer and Builder (to complete set). 4 vol.

Nouvelles Annales de la Construction (to complete set). 4 vol. 10 nos.

Portefeuille Économique des Machines (to complete set). 19 vol.

Zeitschrift für Bauwesen (to complete set). 62 vol. 12 nos.

SUMMARY OF ACCESSIONS.

From May 7th to August 5th, 1902.

Donations (including 61 duplicates and 137 numbers completing volumes of periodicals).....	1 337
By Purchase (including 33 numbers completing volumes of periodicals).....	190
Total.....	<hr/> 1 527

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		Date of Membership.
BAKER, CHARLES HINCKLEY, Pres., Mgr. and Chf. Engr., Snoqualmie Falls Power Co., Seattle, Wash	June 4, 1902	
CARPENTER, GEORGE ANSEL, City Engr., Masonic Temple Bldg., Pawtucket, R. I.....	May 7, 1902	
CLARK, CHARLES HENRY, Chf. Engr., Utica & Mohawk Valley Ry. Co. (Res., 33 Milgate St.) Utica, N. Y.....	May 7, 1902	
CUNNINGHAM, ANDREW OSWALD, Contr. Mgr., American Bridge Co., 418 Chamber of Com- merce Bldg., Cleveland, Ohio.....	Feb. 5, 1902	
DELANO, FREDERIC ADRIAN, Gen. Mgr., C., B. & Q. Ry. Co., 209 Adams St., Chicago, Ill.....	June 4, 1902	
EMERY, JAMES ALBERT, Mgr. of Constr., Birmingham Ry., Light & Power Co., 2104 First Ave., Birmingham, Ala.....	June 4, 1902	
FENDALL, BENJAMIN TRUMAN, City Engr., City Hall, Baltimore, Md.....	May 7, 1902	
GOODNOUGH, XANTHUS HENRY, Chf. Engr., State Board of Health, Room 140, { Assoc. M. State House, Boston, Mass..... } M.	May 6, 1896 June 4, 1902	
GOTSHALL, WILLIAM CHARLES, Pres. and Chf. Engr., New York & Port Chester R. R., 76 William St., New York City.....	May 7, 1902	
HALL, HENRY ARTHUR, Asst. Engr., Metropolitan Park Comm., 14 Beacon St., Boston, Mass.....	May 7, 1902	
HARRIS, STEPHEN, Asst. Engr., Philadelphia & Reading Ry. Co., Room 602, Reading Terminal, Philadelphia, Pa.....	June 4, 1902	
HOWELLS, JULIUS MERRIAM, 401 Douglas Blk., Los Angeles, Cal.....	June 4, 1902	
INGALLS, OWEN LOVEJOY, Insp. of Plumbing, District Bldg., Washing- { Jun. ton, D. C..... } M.	Mar. 5, 1890 June 4, 1902	
IVES, ARTHUR STANLEY, Civ. and Elec. Engr., R. D. Wood & Co., 400 { Jun. Chestnut St., Philadelphia, Pa..... } Assoc. M. M.	Jan. 7, 1896 Jan. 3, 1900 May 7, 1902	
JACOMB HOOD, JOHN WYKEHAM, Chf. Engr., London & South Western Ry., Waterloo Bridge Station, London, S. E., England.....	Feb. 5, 1902	
KENNEDY, JEREMIAH JOSEPH, 52 Broadway, New York City.....	June 4, 1902	

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McGREW, ANSON BURLINGAME, Asst Engr., Pittsburg, Carnegie & Western R. R., Beaver, Pa.....	June 4, 1902
NEHER, CLARENCE RUFUS, 209 Commissioner St., Room 15, Montreal, Que., Canada.	June 4, 1902
O'SHAUGHNESSY, MICHAEL MAURICE, 191 Crocker Bldg., San Francisco, Cal.....	June 4, 1902
RUPLE, COMMODORE PERRY, (Ritchie & Ruple, Civ. and Cons. Engrs.), 413 Chamber of Commerce Bldg., Cleveland, Ohio	March 5, 1902
SHENEHON, FRANCIS CLINTON, U. S. Asst. Engr., Lake Survey, Custom House, Ogdensburg, N. Y.....	May 7, 1902
SMITH, AUGUSTUS, Engr. and Contr., 39 Cortlandt St., New York City.....	June 4, 1902
SUTERMEISTER, ARNOLD HENRY, 306 Washington Ave., Albany, N. Y	June 3, 1902
TITTMANN, OTTO HILGARD, Supt., U. S. Coast and Geodetic Survey, Washington, D.C.	June 4, 1902
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WOERMANN, JOHN WILLIAM, Res. Engr. Illinois and Mississippi Canal, { Assoc. M. Sheffield, Ill. } M.	May 1, 1895 May 7, 1902

ASSOCIATE MEMBERS.

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BAKER, HENRY ERSKINE, Watertown, N. Y.....	May 7, 1902
BANKS, JOHN EDWIN, With American Bridge Co., Pittsburg, Pa.....	June 4, 1902
BOGEN, LOUIS EDWARD, 547 Hale Ave., Avondale, Cincinnati, Ohio.... { Jun. CARTER, ALFRED ELLSWORTH, Asst. Engr., Dept. of Sewers, Tacon 3, Havana, Cuba....	April 30, 1895 June 4, 1902 May 7, 1902
Chf. Engr., Cochin Gov't, Rose Bank, Trichur, South India.....	

		Date of Membership.
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Supt. of Sewers, 11 Dean St., Worcester, Mass.....	May 7, 1902	
GOWEN, SUMNER,		
Asst Engr., Phoenix Bridge Co., Phoenixville, Pa	Jun. May 2, 1899 Assoc. M. June 4, 1902	
NOBLE, FREDERICK CHARLES,		
Asst. Engr., Rapid Transit Comm., Care, A. Noble, 501 West 120th St., New York City.....	June 4, 1902	
ORE, ALEXANDER,		
Supt., Gloversville Water-Works, Glovers- ville, N. Y.....	Jun. June 4, 1901 Assoc. M. Feb. 5, 1902	
ROBERTSON, MARSHALL POPE,		
Member, State Board of Engrs. of La., 225 Carondelet St., New Orleans, La.....	March 5, 1902	
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Asst. Engr., Public Works Dept. of Canada, Box 321, St. John, N. B., Canada	June 4, 1902	
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Asst. Engr., Dept. of Sewers, Borough of Queens, Hack- ett Bldg., Long Island City, N. Y.....	May 7, 1902	
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Care, C. W. Hunt Co., West New Brighton, N. Y.	Jun. Apr. 30, 1905 Assoc. M. Mar. 5, 1902	
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KALTENBACH, HENRY JULIUS,		
Secy. and Treas , Fleischmann Mfg. Co., Peekskill (Res., Park Hill, Yonkers), N. Y.....	June 3, 1902	
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		Date of Membership.
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STOUDER, JOHN BURTON, Roadmaster, Chicago & Northwestern Ry., Mason City, Iowa.....	{ Jun. Assoc.	Mar. 6, 1900 May 6, 1902

JUNIORS.

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COBB, SAMUEL ALLEN, Muskegee, Ind. T.....	June 3, 1902
LAYNG, FRANK RAHN SHUNK, Care, Bessemer & Lake Erie R. R., Greenville, Pa.....	Apr. 1, 1902
WENIGE, ARTHUR EMIL, Asst. Engr., Second Div., Rapid Transit R. R. Comm., 147 Columbus Ave. (Res., 244 East 86th St.), New York City.....	May 6, 1902

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JUNIORS.

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ENZIAN, CHARLES	171 North Franklin St., Wilkesbarre, Pa.
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FORD, WILLIAM HAYDEN.....	The Beaucaire, Haddington, Pa.
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MACCREA, DON ALEXANDER.....	Care, C. O. & G. R. R. Co., Guthrie, Okla. T.
McFETRIDGE, WILLIAM SUTTON	Care, Little Kanawha R. R., Parkersburg, W. Va.
MERZ, LEON.....	S.W. Cor. Third and Brown Sts., Philadelphia, Pa.

- MONSARBAT, NICHOLAS DAUBENNEY.....Supt., Kanawha & Hocking Coal & Coke Co., Longacre, W. Va.
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- RAYNOR, CLARENCE WEBSTER.....Box 385, Kansas City, Mo.
- SKELLY, JAMES WILLIAM.....U. S. Engr. Depot, Foot of Arsenal St., St. Louis, Mo.
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- VAN LOAN, SETH MORTON.....Asst. Engr., Belmont Filter Plant, 2525 Belmont Ave., Philadelphia, Pa.
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- WELLS, CLINTON GLENCAIRN.....City Engr., City Hall, Galveston, Tex.
- WHITNEY, THOMAS BRYAN, JR.....43 West 34th St., New York City.
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- WILLIAMS, ROGER BUTLER, JR.....812 Monadnock Blk., Chicago, Ill.
- YOUNG, HENRY AMERMAN.....110 Ravine Ave., Yonkers, N. Y.

DEATHS.

- BLAKE, EDWARD JOSIAH.....Elected Member, April 3d, 1889; died May 29th, 1902.
- HOBBY, ARTHUR STANLEY.....Elected Member, June 6th, 1894; died May 28th, 1902.
- HOWE, MILTON GROSVENOR.....Elected Member, October 16th, 1872; died June 19th, 1902.
- JOHNSON, JOHN BUTLER.....Elected Member, April 7th, 1886; died June 23d, 1902.
- LINCOLN, WILLIAM SHATTUCK.....Elected Member, December 5th, 1883; died May 16th, 1902.
- MILNE, PETER.....Elected Associate, January 7th, 1896; died June 9th, 1902.
- SHALER, IRA ALEXANDER.....Elected Junior, July 4th, 1888; Member June 5th, 1895; died June 29th, 1902.
- TEMPLE, ROBERT HENRY.....Elected Member, May 6th, 1885; died December 23d, 1901.
- WHITFORD, OSCAR F.....Elected Member, December 6th, 1871; died May 21st, 1902.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(May 7th to August 5th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal, Assoe, Eng. Soc.*, 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings, Eng. Club of Phila.*, 1122 Girard St., Philadelphia, Pa.
- (3) *Journal, Franklin Inst.*, Philadelphia, Pa., 50c.
- (4) *Journal, Western Soc. of Eng.*, Monadnock Block, Chicago, Ill.
- (5) *Transactions, Can. Soc. C. E.*, Montreal, Que., Can.
- (6) *School of Mines Quarterly*, Columbia Univ., New York City, 50c.
- (7) *Technology Quarterly*, Mass. Inst. Tech., Boston, Mass., 75c.
- (8) *Stevens Institute Indicator*, Stevens Inst., Hoboken, N. J., 50c.
- (9) *Engineering Magazine*, New York City, 25c.
- (10) *Cassier's Magazine*, New York City, 25c.
- (11) *Engineering* (London), W. H. Wiley, New York City, 35c.
- (12) *The Engineer* (London), International News Co., New York City, 35c.
- (13) *Engineering News*, New York City, 15c.
- (14) *The Engineering Record*, New York City, 12c.
- (15) *Railroad Gazette*, New York City, 10c.
- (16) *Engineering and Mining Journal*, New York City, 15c.
- (17) *Street Railway Journal*, New York City, 35c.
- (18) *Railway and Engineering Review*, Chicago, Ill., 10c.
- (19) *Scientific American Supplement*, New York City, 10c.
- (20) *Iron Age*, New York City, 10c.
- (21) *Railway Engineer*, London, England, 25c.
- (22) *Iron and Coal Trades Review*, London, England, 25c.
- (23) *Bulletin, American Iron and Steel Assoc.*, Philadelphia, Pa.
- (24) *American Gas Light Journal*, New York City, 10c.
- (25) *American Engineer*, New York City, 20c.
- (26) *Electrical Review*, London, England.
- (27) *Electrical World and Engineer*, New York City, 10c.
- (28) *Journal, New England Water-Works Assoc.*, Boston, \$1.
- (29) *Journal, Society of Arts*, London, England, 15c.
- (30) *Annales des Travaux Publics de Belgique*, Brussels, Belgium.
- (31) *Annales de l' Assoc. des Ing. Sortis des Ecole Spéciales de Gand*, Brussels, Belgium.
- (32) *Mémoires et Compte Rendu des Travaux*, Soc. Ing. Civ. de France, Paris, France.
- (33) *Le Génie Civil*, Paris, France.
- (34) *Portefeuille Économique des Machines*, Paris, France.
- (35) *Nouvelles Annales de la Construction*, Paris, France.
- (36) *La Revue Technique*, Paris, France.
- (37) *Revue de Mécanique*, Paris, France.
- (38) *Revue Générale des Chemins de Fer et des Tramways*, Paris, France.
- (39) *Railway Master Mechanic*, Chicago, Ill., 10c.
- (40) *Railway Age*, Chicago, Ill., 10c.
- (41) *Modern Machinery*, Chicago, Ill., 10c.
- (42) *Transactions, Am. Inst. Elec. Eng.*, New York City, 50c.
- (43) *Annales des Ponts et Chaussées*, Paris, France.
- (44) *Journal, Military Service Institution*, Governor's Island, New York Harbor, 50c.
- (45) *Mines and Minerals*, Scranton, Pa., 20c.
- (46) *Scientific American*, New York City, 8c.
- (47) *Mechanical Engineer*, Manchester, England.
- (48) *Proceedings, Eng. Soc. W. Pa.*, 410 Penn Ave., Pittsburgh, Pa., 50c.
- (49) *Transactions, Mining Inst. of Scotland*, London and Newcastle-upon-Tyne.
- (50) *Municipal Engineering*, Indianapolis, Ind., 25c.
- (51) *Proceedings, Western Railway Club*, 225 Dearborn St., Chicago, Ill., 25c.
- (52) *American Manufacturer and Iron World*, 59 Ninth St., Pittsburgh, Pa.
- (53) *Minutes of Proceedings, Inst. C. E.*, London, England.
- (54) *Power*, New York City, 20c.
- (55) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.
- (56) *Journal of Gas Lighting*, London England, 15c.
- (57) *Cement and Engineering News*, Chicago, Ill., 25c.

Bridge.

- The Great Luxembourg Arch. (12) May 2.
 Cable Making on the New East River Bridge.* (20) May 8.
 Design of Concrete-Steel Arch Bridge.* Daniel B. Luten. (13) May 8.
 The Luxembourg Bridge from the View-Point of an American Designer of Masonry
 Arch Bridges.* (13) May 8.
 A Heavy Double-Track Skew Bridge.* (14) May 10.
 Single-Track Plate-Girder Railroad Bridges at Richmond, Ind.* (14) May 17.
 Allegheny River Bridge and Track Elevation at Pittsburgh.* (15) May 23.
 Moving the Fort Wayne Bridge.* (14) May 31.
 Examples of Bridge Calculations. (21) Serial beginning June.
 The Distribution of Rivets in Iron and Steel Bridges. (21) Serial beginning June.
 Reinforcing a Railroad Bridge in Service.* (15) June 14.
 Bridge over the Mississippi River at Thebes, Ill.* (40) June 20.
 The Desirability of Using a Single Grade of Steel for Bridges. (13) June 26.
 Bascule Bridge at Grand Ave., Milwaukee, Wis.* (13) July 3; (14) July 12.
 Moving the New Brunswick Bridge.* (40) July 4; (14) July 5.
 The Ohio River Bridge at Marietta, Ohio.* (15) July 11.
 An Important Bridge Renewal.* (40) July 11.
 Recent Progress in American Bridge Construction. Henry S. Jacoby. (13) July 17;
 (19) July 19.
 The Royal Alexandra Bridge at Ottawa.* H. D. Bush, M. Am. Soc. C. E. (15) July 18.
 The Westchester Avenue Rolling Bridge, New York.* (14) July 26.
 Design of a Concrete-Steel Arch Culvert.* David B. Luten. (15) Aug. 1.
 Étude de la Déformation Élastique dans les Pièces Comprimées Horizontales.* E.
 Lebert. (43) 1er Trimestre.
 Note sur le Calcul des Arcs Métalliques Surbaissés de Section Peu Variable Reposant
 sur des Clavettes aux Retombées.* M. L. de Boulongne et M. Bedaux. (43) 1er
 Trimestre.
 Note sur les Calculs de Stabilité des Ponts en Arcades du Système Vierendeel. Ed.
 Joyant. (30) Apr.
 Analyse des Observations Faites sur Divers Ponts Métalliques de la Compagnie d'
 Orléans au Moyen des Appareils de M. Rabut. M. Lanna. (38) Serial beginning
 May.
 Notice sur la Construction de Sept Ponts à Poutres Continues sur les Canaux de Selzaete
 à la Mer du Nord et de Déivation de la Lys. A. de Somer. (30) June.
 Fondations par Caissons à Air Comprimé.* Grimaud. (36) Serial beginning June 25.

Electrical.

- Mechanical Speed Changing Devices. Driving Machine Tools from Constant Speed
 Motors. (58) May.
 The Electric Motor in Mill Work. S. S. Wales. (58) May.
 Some Characteristics of Direct Current Motors. Norman Wilson Storer. (58) May.
 The Use of the Electric Motor in Modern Blast Furnace Plants. Andrew Ellicott Mac-
 coun. (58) May.
 Electric Equipment in Modern Machine Shop Practice. F. B. Duncan. (58) May.
 The Karlsruhe Electricity Works.* (26) May 2.
 The Manufacture of Glow Lamps.* (26) Serial beginning May 9.
 The Electrical Equipment of the Experimental Model Basin at Washington Navy Yard.*
 J. Edgar McCrary. (27) May 10.
 The Genesis of Wireless Telegraphy. A. Frederick Collins. (27) May 10.
 The Isolated Plant versus the Central Station—Discussion at the Chicago Electrical As-
 sociation. (27) May 10.
 The English Electro-Metallurgical Company, Limited.* (11) May 16.
 Electric Power Installation at the Ougrée Works, Belgium.* (22) May 16.
 The Cincinnati Gas and Electric Company.* (27) May 17.
 Transformer Testing by Central Station Companies. R. F. Schuchardt. (27) May 17.
 The Field of Force in Wireless Telegraphy. Lee de Forest. (27) May 17.
 Synchronous Motor Calculations. F. G. Baum. (27) May 17.
 Electrically Operated Cranes and Methods of Control.* Frank C. Perkins. (62) May 22.
 Electric Installation at the Upper Forest and Worcester Steel and Tinplate Works.*
 (22) May 23.
 The Bergen County, N. J., Lighting System.* W. J. Jones. (27) May 24.
 The Buckingham Long-Distance Page-Printing Telegraph.* William Maver, Jr. (27)
 May 24.
 The Incandescent Electric Lamp—How Manufactured and Tested.* (19) May 24.
 Creosoted Wooden Poles for Electric Line Work. W. E. Moore. (13) May 29.
 Recent Construction, Atlantic Ave. Station, Edison Electric Illuminating Co., Boston.*
 I. E. Moltrop and R. E. Curtis. (Paper presented at the Convention of the Am.
 Soc. Mech. Engrs.) (14) May 31.
 The Guarini Automatic Wireless Telegraph Repeater.* A. Frederick Collins. (27)
 May 31.
 Telpherage.* Charles M. Clark. (1) June.
 The Real Nature of Electricity and Magnetism. Arthur A. Skeels. (1) June.
 Success in Long-Distance Power Transmission. F. A. C. Perrine. (7) June.
 The 50,000-Volt Transmission Plant of the Missouri River Power Company.* W. G.
 McConnon. (13) June 5; (27) June 7; (16) June 7; (14) June 7.

Electrical—Continued.

- The Atlantic Avenue Station of the Boston Edison Electric Illuminating Co.* I. E. Moulthrop and R. E. Curtis. (Abstract of Paper read before Amer. Soc. Mech. Engrs.) (13) June 5.
- Some Notes on Polyphase Machinery.* A. C. Eborall. (Paper read before the Manchester Section of Inst. of Elec. Engrs.) (11) Serial beginning June 6.
- The Cauveri Falls Electrical Power Transmission.* (12) Serial beginning June 6.
- Automatic Relay Transistor for Long Submarine Cables. S. G. Brown. (Read before the Inst. of Elec. Engrs.) (26) Serial beginning June 6.
- New Electric Lighting Plant for Ottawa, Canada.* A. A. Dion. (27) June 7.
- The Possibilities for a Light-Weight Storage Battery. A. L. Marsh. (27) June 7.
- Protection of Long Distance Transmission Lines. Charles H. Baker. (Abstract of paper read before the National Electric Light Assoc.) (13) June 12.
- The Paralleling of Alternators. (Abstract of paper read by Henry E. Longwell before the Engine Builders' Assoc.) (14) June 14.
- Some Notes on Synchronizing.* Joseph Martin Roman. (27) June 14.
- Works and Products of the Stanley Electric Manufacturing Company.* (27) Serial beginning June 14.
- The Braun and Siemens and Halske Wireless Telegraph System. A. Frederick Collins. (27) June 14.
- The Electrolysis of Gas Mains. James Swinburne. M. Inst. C. E. (66) June 17.
- The Parallel Operation of Alternating Current Generators. (13) June 19.
- The New Electricity Works of the Metropolitan Borough of Shoreditch.* (26) June 20.
- The Edison Storage Battery. Henry F. Joel. A. M. I. C. E. (26) June 20.
- The Cyclone Theory of Magnetism. Henry E. P. P. Cottrell, A. M. I. C. E. (26) Serial beginning June 27.
- Salford Corporation Electricity Works and Tramways.* (26) Serial beginning June 27.
- The Progress of Electric Space Telegraphy. G. Marconi. (26) Serial beginning June 27; (19) June 28.
- Wireless Telegraphy. Jno. Gordon Gray. (2) July.
- Electric Driving for Shops. C. A. Selye. (25) July.
- The Braun-Siemens-Halske System of Wireless Telegraphy.* (19) July 5.
- Electrical Plant at the Düsseldorf Exhibition.* (26) Serial beginning July 11.
- Electric Power Transmission in New Zealand.* (26) Serial beginning July 11.
- Advantages of Electric Transmission. F. J. A. Matthews. (47) Serial beginning July 19.
- The Hoboken Station of the United Electric Company.* (14) July 19.
- The Plant of the Pike's Peak Power Co.* R. M. Jones. (14) July 19.
- New Power House of the Peekskill Lighting and Railroad Company.* (17) July 19.
- An Electric Cement-Making Plant.* (27) July 19.
- Double-Current Generators and Their Application. E. T. Ruthven-Murray. (47) July 26.
- Power Transmission in the Pike's Peak Region.* (27) July 26.
- Electrical Problems of Main-Line Railway Traction. Charles T. Child. (9) Aug.
- Wireless Telegraphy in Meteorology. Emile Guarini. (27) Aug. 2.
- Improvement in Electric Transmission by Wires. Chas. E. Fritts. (27) Aug. 2.
- Installations Électriques de la Cie. Est-Lumière dans la Banlieue Est de Paris.* Henry Martin. (33) May 10.
- La Production Directe de l'Énergie Électrique par le Charbon.* (33) June 14.
- Note sur les Alternateurs Compound: Système Boucherot. E. J. Brunswick. (33) July 5.
- Installations Électriques des Usines du Pied-Selle à Fumay (Ardennes).* C. Dufour. (33) July 12.

Marine.

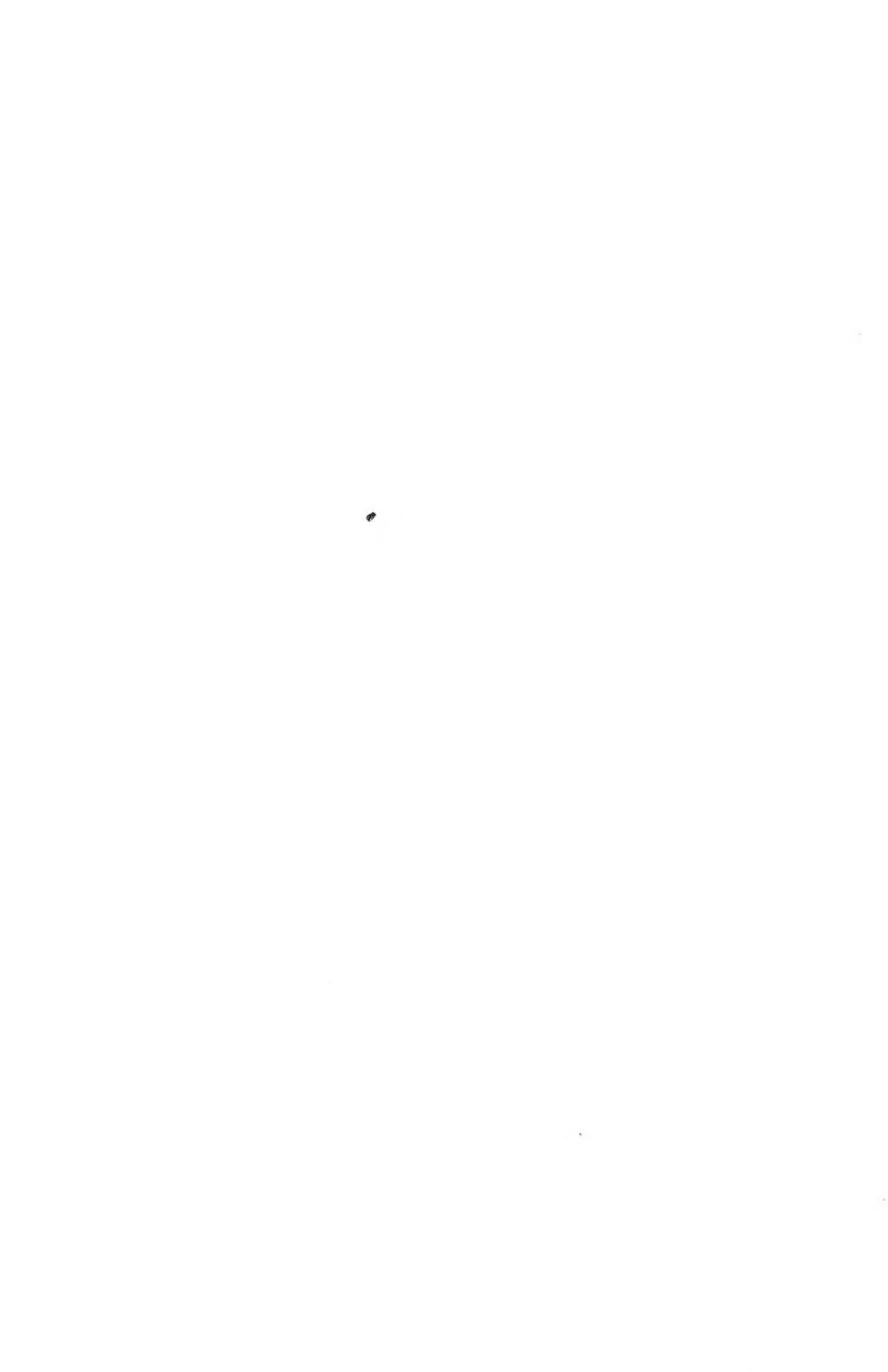
- Comparative Boiler Trials in Italy (Warships).* (11) May 16.
- A Comparison of Five Types of Engines. W. E. Dalby. (Paper read before the Inst. of Naval Archts.) (47) May 31.
- Motive Power for the Modern Launch. E. W. Roberts. (9) June.
- Armour and Guns of Fighting Ships.* Philip R. Alger. (10) June.
- Electricity in a Modern Shipyard.* J. B. O'Hara. (10) June.
- The Bermuda Floating Dock.* (11) June 13.
- The Docking of Battleships. M. Asaoka. (11) June 13.
- Methods of Handling Material over Shipbuilding Berths in American Shipyards. William A. Fairburn. (47) Serial beginning June 21.
- The Peterson Boat-Launching Apparatus.* (10) June 28.
- Report of the Committee on Naval Boilers. (11) Serial beginning July 11.
- Balancing Marine Engines. W. E. Dalby. (Read before the Inst. of Naval Archts.) (11) July 11.
- Coaling Plant for U. S. Navy at East Lamoine, Frenchman's Bay, Maine.* J. A. McNicol, M. Am. Soc. C. E. (13) July 24.
- The Great Eastern.* Joseph Horner. (10) Aug.
- Roulis sur Houle: Déformation et Résistance des Coques de Navires Soumises à des Efforts Statiques et des Actions Dynamiques. (36) Serial beginning May 25.

Mechanical.

- Automobiles.* Harry Percy Maxim. (58) Apr.
- Core Drilling with the Davis Calyx Drill.* L. V. Emanuel. (6) Apr.

Mechanical—Continued.

- Liquid Fuel—Its Application, Past and Present. R. G. Paddock. (1) Apr.
- Welsbach Self-intensifying Lamps.* (66) Apr. 29.
- The Construction and Inspection of Steam Boilers; with Especial Reference to the *City of Trenton* Disaster.* (3) May.
- The Heating Effect of Coal. W. R. Crane. (45) May.
- Mechanical Speed Changing Devices. Driving Machine Tools from Constant Speed Motors. (58) May.
- Protection of Lift-Shafts and Safety Devices in Connection with Lift Doors and Controlling Gear.* (21) May.
- The Renold Silent Chain Gear.* J. O. Nixon. (3) May.
- Thwaite-Gardner Blowing Engine Operated by Furnace Gas at Clay Cross.* (22) May 2.
- Messrs. David Rowan and Co.'s Works, Glasgow.* (11) May 9.
- The Manufacture of Coke from Compressed Fuel.* John H. Darby. (22) May 9; (11) May 23.
- The Recovery of By-Products in Coke-Making. J. Thiry. (22) May 9.
- A New High-Duty Pumping Engine of the Compensating Type.* (14) May 10.
- Ignition and Ignition Gears for Internal-Combustion Engines. Holberry Mensforth, A. M. Inst. Mech. Engrs. (47) May 10.
- The Relative Advantages of Cast Iron and Wrought Iron Gas Mains. Godfrey L. Cabot. (24) May 12.
- Standardization of Pipe Flanges and Flanged Fittings. Robert E. Atkinson. (62) Serial beginning May 15.
- The Mechanical Plant of the Frick Building, Pittsburgh.* (14) May 17.
- The Introduction of the Steam Turbine for Light and Power Work.* Frank C. Perkins. (46) May 17.
- Petroleum as a Fuel. Thos. Paxton. (18) May 17.
- From Old Conditions to New at the Walsall Gas-Works.* (66) Serial beginning May 20.
- Recent Developments in the Gas-Engine. T. Hindson Beare, M. Inst. C. E. (11) Serial beginning May 23; (47) Serial beginning June 7.
- The Diamond in Wire Drawing. S. Barnett. (20) May 29.
- On the Determination of the Irregularity Factor of Engines. Rudolf Franke. (Read before the Verband deutscher Elektrotechniker.) (26) Serial beginning May 30.
- The German Niles Tool Works, Berlin.* (11) Serial beginning May 30.
- The New Diesel Engine.* (12) Serial beginning May 30.
- The Giant Crane of Bremerhaven.* (19) May 31.
- Steam Engine Packing.* A. McSwiney. (Paper read before Birmingham Assoc. of Mech. Engrs.) (47) May 31.
- The Use of Alcohol in Germany for Heat, Light and Power.* Frank H. Mason. (10) June.
- Mechanical Draft.* F. R. Still. (4) June.
- The Battle of the Boilers. Benjamin Taylor. (64) June.
- Retort-Houses for Inclined Retort Settings and Their Development.* Edward Drury. (66) June 3.
- The Condensation of Coal Gas. Harold G. Colman. (66) June 3.
- The Flying Shear.* V. E. Edwards. (Paper presented to Meeting of the Am. Soc. of Mech. Engrs.) (20) June 5; (13) June 5.
- Power Plant of the Schwarzschild & Sulzberger Company, Chicago.* (14) June 7.
- Recovery of Bye-Products in Coke Making.* J. Thiry. (Paper read before the Iron and Steel Inst.) (66) June 10.
- Determining Temperature of Exhaust Gases. R. H. Fernald. (Presented at Boston Meeting of Am. Soc. Mech. Engrs.) (62) June 12.
- The Utilization of Peat as Fuel.* (13) June 12.
- Cold Working Sheet Metal in Dies.* J. D. Riggs, Jun. Am. Soc. M. E. (Abstract of paper presented at Meeting of Am. Soc. Mech. Engrs.) (13) June 12.
- The Hydraulic Air Compressor at Norwich, Conn.* Herbert M. Knight. (13) June 12.
- Elevator Safeties.* Charles R. Pratt, M. Am. Soc. M. E. (Abstract of Paper presented at Meeting of the Am. Soc. Mech. Engrs.) (13) June 12; (14) June 14.
- Detroit Steel Car Works of the American Car & Foundry Company.* (15) June 13.
- Pneumatic Pumping Appliances.* W. C. Popplewell, Assoc. M. Inst. C. E. (47) Serial beginning June 14.
- Piping Materials for Steam Plants. (Paper read before the Engine Builders' Assoc. by John R. Berryman.) (14) June 14.
- The Steam Turbine as Applied to Blowing and Exhausting Apparatus.* W. D. Child. (66) June 17.
- The Parallel Operation of Alternating Current Generators. (13) June 19.
- The Fuel Briquetting Industry in the United States. Wm. G. Irwin. (20) June 19.
- A Simple Form of Fuel Calorimeter. Charles R. Darling. (11) June 20.
- The Manufacture of Tin-Plate. W. H. Tregoning. (22) June 20.
- New Tool Steels and Their Advantages. (22) June 20.
- Carburetors.* (19) June 21.
- The Power Plant at the Elizabethport Shops of the Central Railroad of New Jersey.* (14) June 21.
- Liquid Fuel and Its Application. R. G. Paddock. (47) Serial beginning June 21.
- Large Gas-Engines and the Gases Used by Them.* Dugald Clerk, M. Inst. C. E. (Read at Meeting of the Gas Institute.) (66) June 21.
- A New System of Gas Measurement. T. G. Marsh. (Read at Meeting of the Gas Institute.) (66) June 24.



Mechanical—Continued.

- Efficiency and Economy in Gas Distribution.* Walter Hole. (Read at Meeting of the Gas Institute.) (66) June 24.
 American Plate Mills. (22) June 27.
 Shop Drawings. (11) June 27.
 On Gas-Engine Temperatures. H. E. Wimperis, A. M. Inst. E. E. (11) June 27.
 The Mechanical Plant of the *Chicago Tribune* Building.* (14) June 28.
 The Economy of Mechanical Stoking.* William Wallace Christie. (9) Serial beginning July.
 The Steam Turbine at Hartford.* (64) July.
 A Proposed Standard for Machine Screw Thread Sizes. Charles C. Tyler. (Read at Boston Meeting of the Amer. Soc. of Mech. Engrs.) (41) July; (62) July 17.
 Chains and Their Manufacture.* (20) July 3.
 Grinding Machines and Processes. Joseph Horner. (11) Serial beginning July 4.
 Coke-Oven Charging Machines.* (22) July 4.
 New Apparatus for Testing Materials in the Laboratory. Purdue University, Lafayette, Ind.* William Kendrick Hatt. (11) July 4.
 The U. S. Refrigerating Plant at Manila, P. I.* (14) July 5.
 A Modern Printing Works.* (47) July 5.
 The Selection of Steel for Various Articles. (20) Serial beginning July 10.
 The Status of Alcohol as a Power Source. Marius C. Krarup. (20) July 10.
 The Bleichert Aerial Ropeways.* (22) July 11.
 The Paris-Vienna Motor Car Race.* (12) Serial beginning July 11.
 The Mechanical Plant in the Rogers, Peet Building, New York.* (14) July 12.
 Gas Engines. C. H. Nutting. (20) July 17.
 New Ore Handling Machinery.* Waldo Fawcett. (62) July 17.
 Depreciation of Coal and Coke by Shipment. Stelkens. (Report made to the International Navigation Cong., Düsseldorf.) (11) July 18.
 The Drafting System of a British Engine Shop. (14) July 19.
 Scientific Tests of Alcohol Motors. M. C. Krarup. (20) July 24.
 Pipes and Accessories Used in the Transmission of Power by Compressed Air. W. C. Popplewell. (47) Serial beginning July 26.
 Notes on the Industrial Use of Gas Works Coke.* Alexandre Lencanchez. (24) July 28.
 The Selection and Installation of Hydraulic Elevators.* Henry D. James. (13) July 31.
 Producer Gas; Its Use in Engineering and Shipbuilding. F. J. Rowan. (10) Aug.
 Test of a De Laval Steam Turbine Using Superheated Steam. (14) Aug. 2.
 Les Conditions de Régularité des Machines de Stations Centrales. Alfred Van Der Stegen. (31) Pt. I.
 Procédés et Appareils de Nettoyage des Chaudières Tubulaires.* (37) Apr.
 Gaz igène à Combustion Renversée par Aspiration.* J. Deschamps. (33) Apr. 26.
 Étude Générale du Rendement des Nouvelles Turbines de Laval.* M. Delaporte. (37) Serial beginning May.
 Théorie des Éjecto-Condenseurs et Expériences sur un Nouveau Type des ces Appareils. A. Rateau. (37) June.
 Concours et Exposition de Moteurs et Appareils Utilisant l'Alcool Dénaturé.* G. Coupan. (33) June 21.

Metallurgical.

- A Review on Alloys. Gustav Thurnauer. (61) Apr. 18.
 The Elimination of Silicon in the Acid Open-Hearth. Andrew McWilliam and William H. Hatfield. (22) May 9; (47) May 24.
 A New System of Cooling Tuyeres for Blast-Furnaces. Horace Allen. (22) May 9.
 The Combined Blast-Furnace and Open-Hearth Furnace.* P. Eyermann. (22) May 9; (47) May 24.
 The Chemical and Physical Properties of Carbon in the Hearth of the Blast Furnace. W. J. Foster. (22) May 9.
 The Influence of Chemical Composition on Soundness of Steel Ingots.* Axel Wahlberg. (22) May 9.
 A Useful Alloy of Copper, Nickel, Zinc and Aluminium for Sand Casting. Erwin S. Sperly. (47) May 17.
 Recent Blast-Furnace Practice.* Brierley Denham Healey. (47) Serial beginning May 17.
 Puddled Iron and Mechanical Means for Its Production.* James P. Roe. (20) May 29; (16) May 31.
 Handling Ore at a Blast-Furnace: Some Details of a Typical American Plant.* W. L. Cowles. (10) June.
 The Chase Roasting Furnace.* (16) June 7.
 The Oil-Temp-ring of Mill-Steel Forgings. Thomas Bunt. (Paper read before the Shanghai Soc. of Engrs. and Architects.) (11) June 13.
 The Metallurgy of the Cupola. H. E. Field. (20) June 19; (62) June 19.
 The Molding Machine.* S. H. Stupakoff. (Read before the American Foundrymen's Assoc.) (20) June 19; (62) June 19.
 Cores and Core Arbors.* Edward B. Gilmour. (62) June 19; (20) June 26.
 Changes in the Manufacture of Pig Iron, as Illustrated by the Development of the American Blast Furnace.* John Birkinbine. (2) July.
 Modern Developments in the Production of Open-Hearth Steel. James Christie. (2) July.

Metallurgical—Continued.

- The Steel Trade in the North-East of England.* Henry Simpson. (10) July.
 Canada as a Steel Producer: The Operations of the Dominion Iron & Steel Company.* (10) July.
 Bessemerising of Copper and Copper Mattes. James Douglas. (10) July.
 The Economic Production of Iron and Steel: Influence of Labor-Saving Machinery in the United States.* Theodore W. Robinson. (10) July.
 Upon the Structure of Metals and Binary Alloys.* William Campbell. (3) July.
 The Dry Crushing of Ore. (16) Serial beginning July 5.
 Hot Metal Mixers.* (22) July 18.
 Notes on the Republic District, Washington, with Special Reference to the Metallurgy of its Ores.* J. C. Ralston. (16) July 19.
 Nickel-Steel: Its Practical Development in the United States.* H. F. J. Porter. (10) Aug.
 La Constitution des Alliages. Léon Guillet. (33) Serial beginning June 28.

Military.

- The Evolution of Smokeless Powder and other High Explosives. (11) May 2.
 The New 15-Pounder Quick-Firing Field Artillery Gun.* (12) May 16.
 The Düsseldorf Exhibition: Krupp Pavilion.* (11) Serial beginning June 6.
 Barbette for a Howitzer.* (19) June 14.
 Trench, Parapet or "The Open,"* (44) July.
 Armor Plates Pierced.* (20) July 10.
 Electricity in Its Application to Submarine Mines. John Stephen Sewell. (10) July 19.

Mining.

- Core Drilling with the Davis Calyx Drill.* L. V. Emanuel. (6) Apr.
 The Ehrenfeld Plant of the Webster Coal & Coke Co.* (45) May.
 Compressed Air in Mining. T. W. Barber. M. I. C. E. (62) May 8.
 Winding Plants for Great Depths.* Hans C. Behr. (22) Serial beginning May 16.
 Safety Lamps and Colliery Explosions. (12) May 23.
 Wire Ropes (for Mine Use). W. D. Hardie. (Abstract of Paper read before the Canadian Mining Inst.) (16) May 31.
 Centrifugal Pumps for Mine Work.* W. R. Crane. (45) June.
 Tapping Drowned Workings.* W. B. Wilson, Jr. (45) June.
 Recent Shaft Sinking in Europe by the Freezing Method. (14) June 14.
 Coal Mining in India.* Ernest Benedict. M. Inst. C. E. (10) July.
 The Electric Locomotive for Mine Haulage: Present Practice and Economies.* George Gibbs. (10) July.
 Compressed Air in Mining for Drilling, Hauling, Hoisting and Pumping.* Edward A. Rix. (10) July.
 Coal Cutting Machinery: with Special Reference to American Practice.* Edward W. Parker. (10) July.
 Copper in the United States.* J. Parke Channing. (10) July.
 Gold Dredging in New Zealand.* H. E. Duncan. (10) July.
 Gold Mining in the Transvaal, South Africa.* John Hays Hammond. (10) July.
 Hydraulic Mining, Placer and Alluvial Mining, and Gold Dredging.* George H. Evans. (10) July.
 The Transvaal Mines under the New Régime. John Hays Hammond. (9) July.
 Colliery Ventilating Machinery.* C. M. Percy. (10) July.
 Electricity in Mining.* William B. Clarke. (10) July.
 Water Power in Mining: Its Various Applications in the United States.* A. P. Brayton. (10) July.
 Mining Explosives. James Tonge, Jr. (45) July.
 Compressed Air Haulage. Robert Peele. (45) July.
 Description of Primary Operations and Temporary Plant Required for a Sinking Pit.* Harold T. Foster. (22) July 4.
 Electrically-Driven Centrifugal Pumps in the Horrejo Mines, Spain.* (11) July 18.
 Three-Phase Electric Driving Applied to Coal-Cutting. Roslyn Holiday. (22) July 18.
 Different Methods of Hauling Ore at Bingham, Utah.* W. P. Hardesty. (13) July 24.
 Mining at the Düsseldorf Exhibition. (12) Serial beginning July 25.
 The Application of Suspended Steam-Pumps to the Sinking of Deep Shafts.* W. Price Adell. (22) July 25.
 Sinking a Deep Coal Shaft at Atchison, Kansas. William R. Crane. (16) July 26.
 Anthracite Coal Mining in the United States: A Sketch of the Pennsylvania Coal Fields.* John Birkinbine. M. Am. Inst. M. E. (10) Aug.
 Les Principaux Gisements de Minéraux de Fer du Monde. Léon Demaret. (30) Apr.

Miscellaneous.

- Report on the Metric System. (10) May 10.
 Extraordinary Trench Digging.* (46) June 21.
 Physical and Chemical Laboratory of the J. I. Case Threshing Machine Co., Racine, Wis.* (13) July 10.
 The Duties of Engineers in Enforcing Contracts. Albert J. Himes. M. Am. Soc. C. E. (13) July 17.
 The History of the Institution of Civil Engineers. Charles Hawksley. (14) July 26.

Miscellaneous—Continued.

The Metric System: A Practical View of It, and a Suggestion. E. Sherman Gould, M. Am. Soc. C. E. (10) Aug.
 Voies de Communication et Moyens de Transport à Madagascar: Leur État Actuel—Leur Avenir. F. C. Taupiat-de-Saint-Simeaux. (32) May.

Municipal.

Streets and Roads. James H. Macdonald. (1) Apr.
 Bituminous Macadam Pavements. William H. Burns. (1) May.
 Steel Wheelways for Wagon Roads. Ira O. Baker, M. Am. Soc. C. E. (13) May 8.
 Some Observations upon the Binding of Sand by Stone Dust. Halbert Powers Gillette. (13) May 15.
 The New Specifications for Asphalt Pavements in New York. (14) May 17.
 The Selection of Materials for Macadam Roads. Logan Waller Page. (14) May 17.
 Some Details of Broken-Stone Road Building.* (14) May 24.
 Comparison of Brick Tests and Street Wear. (60) June.
 The Reorganization of the Metropolitan Fire Brigade. (11) July 4.
 The Cost of Brick and Stone Block Pavements. Halbert Powers Gillette. (13) July 24.
 Automatic Street Sweepers.* Walron Fawcett. (60) Aug.
 Failure of Municipal Ownership in England. Robert P. Porter. (17) Serial beginning, Aug. 2.

Railroad.

Maximum Trains; Their Relation to Track, Motive Power and Traffic. E. E. R. Tratman. (65) Apr.
 Construction of Elliptical Springs. Charles A. Lindstrom. (61) Apr. 18.
 Reminiscences of Half a Century. M. N. Forney. (65) May.
 Light Mountain Railways. George B. Francis. (1) May.
 Burlington Route Test Car.* Max H. Wickhorst. (30) May.
 Chicago Great Western Tandem Compound.* (30) May.
 The Trans-Australian Railway. (12) May 2.
 Interlocking Construction and Specifications. C. O. Tilton. (40) May 9.
 Track Improvements on the Baltimore & Ohio.* (40) May 9.
 Norfolk & Western Standard Equipment.* (40) May 9.
 The Electric Elevated and Underground Road of Berlin.* (27) May 10.
 Test and Dynamometer Car, Chicago, Burlington & Quincy R. R.* (13) May 15.
 Automatic Block Signals on the Philadelphia and New York Divisions of the Pennsylvania Railroad.* (15) May 16.
 Standard Freight Locomotives of the Columbian Government.* (15) May 16.
 A Diagnosis of M. C. B. Coupler Defects, Based on Results Obtained in Service. R. D. Smith. (61) May 20.
 Western Railway Club: Report of Committee on Draft Rigging in Relation to the Whole Cars. (61) May 20.
 Industrial Railways.* Walron Fawcett. (62) May 22.
 The Atlantic Avenue Improvements of the Long Island R. R. in Brooklyn.* (13) May 22.
 Pennsylvania Standard Consolidation Engine.* (40) May 23.
 Early History of the Delaware, Lackawanna & Western Railroad and Its Locomotives.* Herbert T. Walker. (15) Serial beginning May 30.
 Water-Tube Boiler for Locomotives.* (11) May 30.
 Baldwin Decapod for the Santa Fé.* (40) May 30.
 Crossing and Slip Switch Renewals on the Chicago & Western Indiana R. R.* (18) May 31.
 Pennsylvania Division Shops of the N. Y. C. & H. R. R.* (18) May 31.
 Features of Continental Locomotive Construction.* Charles R. King. (9) June.
 Oak Grove Shops of the New York Central.* (39) June.
 Modern Car Design. C. A. Selye. (25) June.
 Oil Fuel for Locomotives: Hoosac Tunnel, Boston & Maine Railroad. (25) June.
 Atlantic Type Fast Passenger Locomotive, Pennsylvania Railroad.* (25) June.
 Decapod Tandem Compound Freight Locomotive; Atchison, Topeka & Santa Fé Railway.* (25) June.
 Mechanical Stokers for Locomotives.* Fred. H. Colvin. (Paper presented to Meeting of the Amer. Soc. of Mech. Engrs.) (26) June 5; (13) June 5; (18) June 14.
 Recent Locomotives of the Illinois Central Railroad.* (40) June 6.
 The Perfection Fuel Economizer and Smoke Consumer.* (40) June 6.
 Billing of American Locomotives.* (46) Serial beginning June 7.
 Self-Dumping Cars in Railroad Construction.* Day Allen Willey. (46) June 7.
 Notes on Some Twentieth Century Locomotives. Charles Rous-Marten. (47) Serial beginning June 7.
 The Elevated Structure of the Atlantic Avenue Improvement, Brooklyn.* (14) June 7.
 Electric Traction and Standard Railways. E. Huber. (17) June 7.
 Staybolt Breakage.* (15) June 13.
 New Engine House of the Boston & Maine at East Cambridge.* (15) June 13.
 Cast-Iron Wheels Under Heavy Cars.* (15) June 13.
 Some Modern Draft Gears.* (15) June 13.
 The Structural Steel Car Company.* (15) June 13.

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- Some Experience with Special Wheels in Heavy Service. P. H. Griffin. (15) June 13.
 The Railroad Telephone. C. A. Hammond. (15) June 13.
 New Power for the Frisco System.* (40) June 13.
 The Baring Cross Shops of the St. Louis, Iron Mountain & Southern Railway.* (40) June 13; (18) Serial beginning June 14.
 The Locomotive Piston Valve.* (18) June 14.
 The Largest Geared Locomotive Yet Built—El Paso & Rock Island Route.* (18) June 14; (15) June 20.
 The Question of Power for Railroad Repair Shops. (18) June 14.
 The Electric Road of Berthoud-Thoune, Switzerland.* (46) June 14.
 The New Beacon Mountain Railway.* (17) June 17.
 Michigan Central Shops at Jackson, Mich.* (40) June 20.
 Competitive Locomotive Types for the Illinois Central.* (15) June 20.
 New Locomotive Equipment for the St. Louis & San Francisco R. R.* (18) June 21.
 The Cedar Lake Shops of the Minneapolis & St. Louis R. R.* (18) June 21.
 M. N. Forney's Feed Water Heater for Locomotives.* (15) June 27; (25) July; (47) July 12; (18) Aug. 2.
 The Chicago & Alton Shops at Bloomington, Ill.* (15) June 27.
 Two New Types of Suburban Locomotives.* (40) June 27; (15) June 20.
 An Improved Fuel Economizer and Smoke Consumer.* (18) June 28.
 Railway Blocks and Telegraphs—Recent Practice. (21) July.
 The Effect of Waterways on Railway Transportation. S. A. Thompson. (6) July.
 Steel Rails: Relations between Structure and Durability.* Robert Job. (3) Serial beginning July; (15) July 4; (13) July 3.
 The Pryor Gap Tunnel; Burlington & Missouri River R. R.* F. T. Darrow. (13) July 3.
 Prospective Railway Development in British Equatorial Africa. C. Steuart Betton. (29) July 4.
 The Simpson Tunnel and Its Construction. (12) Serial beginning July 4.
 The Construction of a First-Class French Locomotive.* (12) Serial beginning July 4.
 Grand Rapids, Grand Haven & Muskegon Railway.* (17) July 5.
 Train Resistance. A. H. Armstrong. (17) July 5.
 Train Resistance Formulae. John Batch Blood. (17) July 5.
 Tests of the Friction of Side Bearings and Center Plates for Freight Cars: Abstract of Report of Special Committee of the Master Car Builders' Assoc.* (13) July 10.
 Modern Water Supply for Locomotives.* F. M. Whyte. (15) July 11.
 Electric Driving for Shops. C. A. Selye. (Paper read before the Amer. Ry. Master Mech. Assoc.) (18) July 12.
 A Combination Transfer Table and Car Elevator.* (13) July 17.
 Railway Grade Crossing Protection in Texas. (13) July 17.
 The Superintendent, the Conductor and the Engineman. B. B. Adams. (15) July 18.
 Crosshead and Piston Rod Connection.* Roger Atkinson. (15) July 18.
 The Commodity Ton Mile. S. M. Hudson. (40) July 18.
 Automatic Train-Order Signal, Hocking Valley Ry.* (18) July 19.
 A Typical Shop to Serve for 300 Locomotives.* L. R. Pomeroy. (Read before Annual Convention of the Amer. Ry. Master Mech. Assoc.) (18) Serial beginning July 19; (25) Aug.
 A Lens Mirror Locomotive Headlight.* (13) July 24.
 The Perfection Fuel Economizer and Smoke Consumer.* (15) July 25.
 "Boulder" Signalling and New Express Locomotives on the Caledonian Railway.* Norman D. Macdonald. (40) July 25.
 The Baltimore & Ohio Third Rail System.* (40) July 25.
 The Tehuantepec Railroad vs. the Isthmian Canal.* (46) July 26.
 Consolidation Freight Locomotives for N. Y. C. & St. L. and P., C. C. & St. L. Roads.* (18) July 26.
 A Large Shay-Patent Locomotive; The El Paso & Rock Island Route.* (25) Aug.
 The Mexican Railway System.* Victor M. Braschi and Ezequiel Ordoñez. (10) Aug.
 Up-to-date Roundhouses.* (25) Aug.
 Passenger Engines for the Chesapeake & Ohio and the Missouri Pacific.* (15) Aug. 1.
 A New Method of Steel Car Construction. (18) Aug. 2.
 The Mechanical and Electrical Equipment of the Pittsburgh & Lake Erie Railroad Terminal, Pittsburgh.* (14) Serial beginning Aug. 2.
 Les Tramways à Vapeur aux Indes Néerlandaises (Java, Madoura et Sumatra). Auguste Moreau. (32) Mar.
 Les Chemins de Fer de l'Etat de Saint-Paul (Brésil).* (38) May.
 Les Voitures des Chemins de Fer Italiennes à l'Exposition Universelle de 1900.* A. Marizot. (34) May.
 Applications de la Vapeur Surchauffée aux Locomotives.* F. Barbier. (33) May 31.
 Nouvelle Ligne de Paris à Versailles; Tunnel de Mendon.* A. Dumas. (33) June 7.
 Locomotives Compound à Quatre Cylindres de la Compagnie des Chemins de Fer de l'Est.* L. Pierre Guédon. (34) Serial beginning July.
 Note sur les Travaux de la Ligne d'Issy à Viry-Châtillon.* M. Rabut. (38) July.
 Nouvelles Locomotives Compound à Quatre Cylindres à Dispositif de Démarrage Système Goelsdorf.* L. Pierre Guédon. (33) July 12.

Railroad, Street.

- Electric Traction. Philip Dawson. (26) Serial beginning May 9.
 The New Electric Rapid Transit Railway in Berlin, Germany.* (13) May 15.

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- Causes and Remedies for Vibration. A. Millock. (17) May 17.
 Selection of Street Railway Motor Equipment. Fred A. Jones. (17) May 17.
 Express and Light Freight Traffic on Electric Roads. (15) May 23.
 Restrictions on the Controller Handle. J. R. Cravath. (17) May 24.
 Power Plant of the Hartford & Springfield Street Railway Co.* (14) May 24.
 Construction of the Metropolitan Railway, Paris.* (14) May 24.
 Camp's Bay, Cape Town and Sea Point Tramways.* (26) May 30.
 Problems of Electric Railways. J. Swinburne and W. R. Cooper. (Paper read before the Inst. of Elec. Engrs.) (19) Serial beginning May 31.
 The Vevey-Mont Pèlerin Funicular Electric Railway.* Enrico Bignami. (9) June.
 Cardiff Corporation Tramway.* (26) June 6; (17) July 5.
 Electric Railway Practice on the Continent of Europe.* Heinrich Vellguth. (17) June 7.
 Results of Tests for Air Resistance on the Berlin-Zossen Experimental High Speed Line.* (17) June 7 and Aug. 2.
 Mineola, Hempstead and Freeport Traction Company.* (17) June 28.
 The Design of Conductors for Electric Railways. (47) June 28.
 The Mechanical Engineering of an Electric Railway.* Howard P. Quick. (9) July.
 New Equipment of the Liverpool Overhead Railway.* (26) July 4; (17) July 19.
 Collectors for Heavy Traction. George T. Hanchett. (17) July 5.
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 Trolley Omnibus Line between Nice and Upper Monte Carlo.* (17) Aug. 2.
 The System of the Youngstown Sharon Railway and Light Company.* (17) Aug. 2.
 The Electric Third Rail.* W. B. Potter. (17) Aug. 2.
 Description du Réseau des Tramways Électriques de Marseille.* M. Denizet. (43) 1er Trimestre.
 Les Chemins de Fer Électriques. Léon Gerard. (32) Mar.
 Chemin de Fer sur Route de Paris à Arpajon.* G. Boëto. (33) Apr. 26.
 Métropolitain d'Intérêt Local de Berlin: Installations Électriques et Matériel Rouleur.* Henry Martin. (33) May 17.
 Conduite Souterraine à Rainure Latérale.* A. Vallee. (36) May 25.
 Équipement de la Sous-Station des "London United Tramways". (36) May 25.
 Chemin de Fer à Traction Électrique du Fayet à Chamonix.* Henry Martin. (33) Serial beginning June 28.
 Note sur le Dépot de la Compagnie des Tramways de l'Est, Parisien aux Lilas (Seine).* G. Lelarge. (38) July.

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- The Intermittent Sewage Filters at Pittsfield, Mass.* (14) May 10.
 The Action of the Septic Tank on Acid Sewage. (14) May 10.
 New System of Street Cleaning.* (46) May 10.
 Electro Pneumatic Control of the Moon Island Sewage Reservoir. (18) May 17.
 Electric Sewage Pumps, Septic Tanks and Contact Beds at Fond du Lac, Wis.* Geo. S. Pierson, M. Am. Soc. C. E. (13) May 22.
 Experiments at Worcester, Mass., on Treating Acid Iron Sewage in a Closed Septic Tank. Leonard P. Kinnicutt and Harrison P. Eddy. (13) May 29.
 The Present Status of the Sewage Problem in England.* Leonard P. Kinnicutt. (1) June.
 The Purification of Sewage. (Paper read before the Illinois Society of Civ. Engrs. and Surveyors). (60) June.
 Heating a New York Residence.* (14) June 14.
 The Mitchell System of Sewage Disposal. (14) June 14.
 The Sanitary Measures to be Adopted after Floods. George A. Soper. (10) June 11.
 Sewage Purification Works at Bepeew, N. Y.* G. Everett Hill. (13) June 26.
 House Drainage. A. B. Raymond. (Paper read before the Michigan Eng. Soc.) (60) July.
 Water Supply in the Carnegie Residence, New York.* (14) July 5.
 The Drainage of New Orleans. (11) July 25.
 Concrete Sewer Construction at the Chicago Clearing Yards. (14) Aug. 2.
 Plumbing in the Carnegie Residence, New York.* (14) Aug. 2.
 L'Épuration des Eaux d'Egouts en Belgique par la Méthode Chimicobiologique. Duyk. (30) Apr.

Structural.

- A New Method of Testing Fire-Resisting Qualities of Fireproofed Wood.* Ira H. Woolson, M. Am. Soc. M. E. (6) Apr.
 On the Burning of Portland Cement. Wm. B. Newberry. (67) May.
 The Determination of Unit Stresses in the General Case of Flexure. L. J. Johnson. (1) May.

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- Underpinning the Decker Building, New York.* (14) May 10.
 Theory of the Strength of Beams of Reinforced Concrete. W. Kendrick Hatt. (Abstract of Paper read before the Indiana Eng. Soc.) (14) May 10.
 The New York Stock Exchange Building.* (14) May 17 and May 24.
 Fire Tests of Fireproof Floors by the New York Building Department.* (13) May 29.
 A Visit to the Plant of the Edison Portland Cement Co. at Stewartsville, N. J. (13) May 29.
 A Steel and Concrete Coal Storage Plant.* Franklin M. Bowman. (Abstract of Paper presented at the Convention of the Am. Soc. M. E.) (14) May 31.
 The Twenty-Third Street Y. M. C. A. Building, New York.* (14) May 31.
 The Designing of an Office Building.* Colbert A. MacClure. (58) June.
 The Fire-Proofing of High Office Buildings. Peter B. Wight. (58) June.
 The Building Laws of the City of Pittsburgh. J. A. A. Brown. (58) June.
 Monier Cement Storage Elevator at South Chicago.* (67) June.
 Wet, Dry or Medium Concrete. H. W. Parkhurst. (4) June.
 Practical Strength of Columns or Struts of Wrought Iron and Mild Steel.* J. M. Moncrieff, M. Inst. C. E. (11) June 6.
 Acoustics of Audience Halls. C. H. Blackall. (Reprinted from the *Technograph*.) (14) June 7.
 Extension of the Corn Exchange Bank Building, New York.* (14) June 14.
 The Pneumatic Foundations of the Battery Place Building, New York.* (14) June 21.
 The North German Lloyd Pier-Sheds, Hoboken.* (14) Serial beginning June 21.
 The Permeability of Concrete under High Water Pressures. J. B. McIntyre and A. L. True. (13) June 26.
 The New Pittsburg Plant of the American Bridge Co., near Economy, Pa.* (13) June 26.
 Anti Corrosive Paints; Their Qualities and Composition. (11) June 27.
 Tests of Reinforced Concrete Beams. W. Kendrick Hatt. (Paper read before Amer. Section, International Assoc. for Testing Materials.) (14) June 28.
 The Cement Testing Laboratory at Cornell University* Edgar B. Kay. (60) July.
 Various Recipes for Cements, Mortars, etc. (67) July.
 Portland Cement; Its Constitution, Properties and Manufacture. Richard K. Meade. (3) July.
 Portland Cement: Description of Methods Employed in Its Manufacture and Types of American and Foreign Cement Machinery. Richard K. Meade. (45) July.
 Underpinning a Tall and Narrow Brick Building.* (14) July 5.
 Standard Cement Specifications. R. W. Lesley, Assoc. Am. Soc. C. E. (Paper read before the Amer. Section, International Assoc. for Testing Materials.) (14) July 5.
 Cement Testing in Municipal Laboratories. R. L. Humphrey. (Paper read before the Amer. Section, International Assoc. for Testing Materials.) (14) July 12.
 Notes on Experience in Masonry Construction. F. A. Mahan. (13) July 17.
 The Manufacture of Cement from Slag; The Curtin Process.* (20) July 17.
 The Battery Place Building, New York.* (14) July 19.
 Some Recent Experiments with Cements, Mortar and Concrete. Thomas S. Clark. (13) July 24.
 Diagrams for Determining the Weight of Steel Trusses and Plate Girders. H. G. Tyrrell. (11) July 25.
 Raymond Concrete Piles.* (18) July 26.
 Accuracy and Value in the Testing of Cast Iron. Richard Moldenke. (9) Aug.
 Test of a Concrete Slab Reinforced with Expanded Metal.* O. W. Connet. (14) Aug. 2.
 Expériences sur le Ciment Armé. M. Breuillé. (43) 1er Trimestre.
 Note sur les Constructions en Ciment Armé. Boussiron. (36) Serial beginning May 10.
 Les Bétons de Ciment Armés. M. Dumas. (30) June.
 Méthode de M. Brinell pour la Détermination de la Duréte des Corps par l'Enforcement d'une Bille d'Acier dans la Substance Étudiée. (30) June 10.
 Fabrication du Portland Artificiel par Fours Portatifs. E. Leduc. (36) July 10.

Topographical

- A Labor-Saving Tool for the Drafting Room.* (13) May 15.
 The Arid District between the Rio Grande and the Pacific Traversed by the Engineers of the Mexican Boundary Commission in 1892-94. Oscar C. S. Carter. (2) July.
 New Types of Hand Surveying Instruments.* (11) July 11.
 Surveying in Central America. (14) July 19.
 Ferguson's Surveying Circle and Percentage Unit of Angular Measurement John C. Ferguson, M. Inst. C. E. (11) July 25.

Water Supply.

- Filtration of River Water. Alfred J. Jenkins, Assoc. M. Inst. C. E. (66) Apr. 29.
 The Iron Coagulant Process at Lorain. (14) May 10.
 The Kenncott Water Softening System.* (13) May 15.
 The Utility of Subsiding Basins. (14) May 17.
 Concrete Lined Reservoir with Concave Slopes at Aurora, Ill. (13) May 22.
 Recent Developments in Punjab Irrigation. Sydney Preston. (29) May 30.
 The Purification of Feed Water.* (19) May 31.

Water Supply—Continued.

- Preliminary Report of the Committee on Standard Specifications for Cast-Iron Pipe, with Discussion. Freeman C. Coffin, F. F. Forbes and Dexter Brackett. (28) June.
 The Marlborough Water-Works.* George A. Stacy. (28) June.
 Investigations in Regard to Coloring Matter in Water and Methods of Removal. (28) June.
 Rainfalls. Alfred F. Théard. (1) June.
 A Study of Self Purification in the Sudbury River. A. G. Woodman, C. E. A. Winslow and Paul Hansen. (7) June.
 The Earth Work of the Wachusett Reservoir. Robert M. Pratt. (60) June.
 Auxiliary Water Supply for Fire Protection in Chicago.* (67) June.
 Water Treating Systems.* J. C. William Greth. (62) June 5.
 Relation of Rainfall to Runoff in California.* J. B. Lippincott, M. Am. Soc. C. E. and S. G. Bennett. (13) June 5.
 The Cauveri Falls Electrical Power Transmission.* (12) Serial beginning June 6.
 The Hydraulie Air Compressor at Norwich, Conn.* Herbert M. Knight. (13) June 12.
 Measurement of the Flow of Water in the Sudbury and Cochituate Aqueducts. Walter W. Patch. (13) June 12.
 Standard Methods of Determining Turbidity and Color in Water; Issued by the Division of Hydrography, U. S. Geological Survey. (14) June 14.
 A Classified Review of Dam and Reservoir Failures in the United States. William R. Hill, M. Am. Soc. C. E. (13) June 19.
 New Irrigation Works and Methods in Colorado. H. A. Crafts. (14) June 21.
 Water Cost and Water Waste. A. L. Holmes. (Paper read before the Michigan Eng. Soc.) (60) July.
 The Tabern High Earth Dam, near Jackson, Cal.* (13) July 10.
 New Water-Works for Loughborough.* (11) July 11.
 Electric Power Transmission in New Zealand.* (26) Serial beginning July 11.
 The Financial Questions in Water-Works Valuations. John W. Alvord. (Abstract of Paper read before the Amer. Water-Works Assoc.) (14) July 12.
 Experiments on the Purification of the Springfield Water Supply. (14) July 12.
 The Purification and Sterilization of Water. Dr. Rideal. (29) July 18.
 The Plant of the Pike's Peak Power Co.* R. M. Jones. (14) July 19.
 The "Rust Stains" from Water Containing Crenothrix. (14) July 26.
 Modern Filtration.* Robert E. Milligan. (60) Aug.
 The Loss of Capacity of the Vyrnwy Aqueduct, Liverpool, England. (14) Aug. 2.
 L'Utilisation des Chutes d'Eau dans les Alpes Françaises. M. R. Tavernier. (32) May.
 Installations Électriques des Usines du Pied-Selle à Fumay (Ardennes).* C. Dufour. (33) July 12.

Waterways.

- The Proposed Inter-Oceanic Canal. (12) May 2.
 The Conditions Governing the Panama and the Nicaragua Canal Routes. George S. Morison. (Address before the Massachusetts Reform Club.) (15) May 9.
 The New Breakwater at Port Colborne, Ontario; Welland Canal Entrance.* (13) May 15.
 Concrete Breakwater Construction at Buffalo, New York.* T. W. Symons, M. Am. Soc. C. E. (13) May 29.
 Dock Construction in and Around Buffalo. S. M. Kielland. (1) June.
 Revetment Work on the Missouri River; Chicago & Alton Ry.* W. R. De Witt. (13) June 5.
 Haupt's Reaction Breakwater: Being the Report of the Franklin Institute. (3) July.
 The Effect of Waterways on Railway Transportation. S. A. Thompson. (9) July.
 The Panama Canal. (11) July 4.
 Coast Fog Signals.* N. G. Gelye, A. M. Inst. C. E. (12) Serial beginning July 4.
 An Automatic Lightship.* Waldon Fawcett. (46) Aug. 2.
 Canal du Nivernais; Établissement du Tonage Mécanique dans le Bief de Partage.* M. Mazoyer. (43) 1^{er} Trimestre.
 Mémoire sur la Forme des Cours d'Eau à Fond Mobile.* Georges Poisson. (43) 1^{er} Trimestre.
 Le Port Marchand de Brest et Son Avenir Prochain. E. Duchesne. (32) Apr.
 La Protection contre les Infiltrations des Ouvrages d'Art en Maçonnerie du Canal de Dortmund à l'Ems.* H. Genard and G. Deniz. (30) Apr.
 Nouvelles Cales de Radoub du Port de Kiel. E. Barberot. (35) May.
 Tonage Mécanique Établi au Bief de Partage du Canal du Nivernais.* Mazoyer. (35) Serial beginning May.
 La Loire Navigable.* René Philippe. (33) Serial beginning May 24.
 Les Canaux de Liège vers Anvers et les Pays Bas au Point de Vue de l'Établissement de la Traction Mécanique des Bateaux. G. Herman. (30) June.
 Drague Marine à Godets pour le Port de Tsingtau (Chine).* A. de Riva-Berni. (33) June 14.
 La Seine Maritime.* L. Sekutowicz. (33) Serial beginning July 19.

PROCEEDINGS
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NEW YORK 1902.

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The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays Fourth of July, Thanksgiving Day and Christmas Day.

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AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

September 3d, 1902.—The meeting was called to order at 8.35 p. m., Rudolph Hering, M. Am. Soc. C. E., in the chair; Assistant Secretary T. J. McMinn acting as Secretary; and present, also, 59 members and 8 visitors.

The minutes of the meetings of the Annual Convention, held at Washington, D. C., May 20th to 23d, and of June 4th, 1902, were approved as printed in *Proceedings* for August, 1902.

A paper by R. C. McCalla, M. Am. Soc. C. E., entitled "Improvement of the Black Warrior, Warrior and Tombigbee Rivers, in Alabama," was presented in abstract by the Acting Secretary, who also read discussions by Messrs. W. L. Sibert, George Y. Wisner and D. A. Watt. Additional communications on the subject, by Messrs. John M. G. Watt and Nat. A. Yuille were presented by title only. The paper was discussed orally by Messrs. Edward P. North and Samuel Whinery.

Ballots for membership were canvassed, and the following candidates were elected.

AS MEMBERS.

- WALTER EUGENE ANGIER, Thebes, Ill.
FREDERICK THOMAS BARCROFT, Detroit, Mich.
OLIVER W CHILDS, St. Louis, Mo.
FREDERICK WILLIAM COHEN, Harrisburg, Pa.
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WILLIAM WILLIAMS CREHORE, New York City.
GRIFFITH MORGAN ELDREDGE, Tampa, Fla.
ELLIOT HOLBROOK, Kansas City, Mo.
EDWARD TEN EYCK LANSING, Little Falls, N. Y.
WILLIAM NAYLOR McDONALD, Havana, Cuba.

AS ASSOCIATE MEMBERS.

- RICHARD I DOWNING ASHBRIDGE, Philadelphia, Pa.
MILES CARLISLE BLAND, Cleveland, Ohio.
ARRAHAM GIDEON, Havana, Cuba.
JOHN THOMAS HENDERSON, Hartford, Conn.
FRANCIS DEY HUGHES, Kansas City, Mo.
GEORGE ALBERT NOSKA, New York City.
HENRY VAN BUREN OSBOURN, Philadelphia, Pa.
JOHN GATES PECK, Albany, N. Y.
EUGENE EVERETT PETTEE, Newtonville, Mass.
JAMES WALTER RICKEY, Minneapolis, Minn.
LOUIS JOHN RIEGLER, Allegheny, Pa.
GEORGE THOMAS ROBERTS, Buffalo, N. Y.
FRANCIS NICOLL SANDERS, ALBANY, N. Y.
MOSES HANNIBAL WRIGHT, Nashville, Tenn.

The Acting Secretary announced that at the meeting of the Board of Direction, September 2d, 1902, reconsideration ballots had been canvassed, and that the following candidates had been elected:

AS MEMBERS.

- OTTO MARC EIDLITZ, New York City.
HANS AUGUST EVALD CONRAD VON SCHON, Sault Ste. Marie, Mich.

AS ASSOCIATE MEMBER.

- GEORGE CORRIE BARTRAM, Boston, Mass.

The Acting Secretary announced that at the meeting of the Board of Direction, September 2d, 1902, the following candidates had been elected:

AS JUNIORS.

FRANK LORN CAMPBELL BOND, New York City.
HARRY GILBERT BURROWES, Brooklyn, N. Y.
WILLIAM STEWART GETCHELL, Denver, Colo.
ROBERT AUSTEN McCULLOCH, Orange, N. J.
RUDOLPH QUANZ, West Hoboken, N. J.
CLINTON LEROY RICHARDSON, New York City.
ALBERT LYMAN TRUE, Portland, Me.

The Acting Seeretary announced the following deaths:

OSCAR F. WHITFORD; elected Member December 6th, 1871; died May 21st, 1902.

ARTHUR STANLEY HOBBY; elected Member June 6th, 1894; died May 28th, 1902.

PETER MILNE; elected Associate January 7th, 1896; died June 9th, 1902.

MILTON GROSVENOR HOWE; elected Member October 16th, 1872; died June 19th, 1902.

JOHN BUTLER JOHNSON; elected Member April 7th, 1886; died June 23d, 1902.

IRA ALEXANDER SHALER; elected Junior July 4th, 1888; Member June 5th, 1895; died June 29th, 1902.

LORENZO RUSSELL CLAPP; elected Member February 1st, 1888; died August 13th, 1902.

WILLIAM HASELL WILSON; elected Honorary Member August 2d, 1892; died August 17th, 1902.

EDMUND PHILLIPS HANNAFORD; elected Member September 18th, 1872; died August 19th, 1902.

Adjourned.

September 17th, 1902.—The meeting was ealled to order at 8.40 p. m., J. A. Oekerson, M. Am. Soc. C. E., in the chair; T. J. McMinn, Assistant Secretary, acting as Secretary; and present, also, 97 members and 12 guests.

A paper entitled "The Maintenance of Asphalt Streets," by James N. Hazlehurst, M. Am. Soc. C. E., was presented by the Acting Secretary.

The subject was discussed by Messrs. Samuel Whinery, N. P. Lewis, W. Boardman Reed, A. V. Abbott, J. M. Evans and S. C. Thompson.

The Acting Seeretary announced the death of the following members:

WILLIAM DURFEE GELETTE, elected Member April 1st, 1885; died April 27th, 1902.

HENRY LAWRENCE CLEVERDON, elected Associate Member March 1st, 1899; died August 27th, 1902.

Adjourned.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, October 1st, 1902.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and a paper by Theron A. Noble, M. Am. Soc. C. E., entitled "The Flow of Water in Wood Pipes," will be presented for discussion.

This paper was printed in the *Proceedings* for August, 1902.

Wednesday, October 15th, 1902.—8.30 p. m.—At this meeting, a paper, entitled "The Protection and Improvement of Foreshores by the Utilization of Tidal and Wave Action," by R. G. Allanson-Winn, M. Inst. C. E., I., will be presented for discussion.

This paper was printed in the *Proceedings* for August, 1902.

Wednesday, November 5th, 1902.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and a paper by Isaac Harby, Jun. Am. Soc. C. E., entitled "The Footbridge for Building the Cables of The New East River Bridge," will be presented for discussion.

This paper is printed in this number of *Proceedings*.

ACCESSIONS TO THE LIBRARY.

From August 6th to September 9th, 1902

DONATIONS.*

MATERIALS OF MACHINES.

By Albert W. Smith. Cloth, $7\frac{1}{2}$ x 5 ins., 142 pp., illus. New York, John Wiley & Sons, 1902. \$1.00.

In the prefatory note, the author states that this book is the result of an effort to bring together concisely the information necessary to him who has to select materials for machine parts. The chapter headings are: Outline of the Metallurgy of Iron and Steel; Testing; Stress Strain Diagrams; Cast Iron; Wrought Iron and Steel; Alloys; Selection of Material. There is an index of seven pages.

TABLES FOR CALCULATING THE CUBIC CONTENTS OF EXCAVATIONS AND EMBANKMENTS.

By John R. Hudson, M. Am. Soc. C. E. Third Edition. Cloth, 9 x 6 ins., 131 pp. New York, John Wiley & Sons, 1902. \$1.00.

The preface calls attention to a short and simple rule, which, in three-level ground, is well adapted to take the place of the ordinary method of "averaging end areas," and giving the same answer, while the process is one third shorter. An example, given in the preface, shows that the entire process consists in addition, subtraction, and inspection of the tables, thus avoiding the errors likely to occur in the multiplications forming part of the usual methods. When three heights are taken at a station, the examples in the preface show, by comparison, the advantage of using the methods of computing earthwork quantities given in this work. Forms for cross-section books are shown, which will be found useful and convenient for recording and preserving field notes and office computations when these tables are used.

Gifts have also been received from the following:

- Aachen Königliche Technische Hochschule, 3 pam
- Alabama Great Southern R. R. Co. 1 pam.
- Am. Inst. of Elec. Engrs. 1 bound vol.
- Am. Water-Works Assoc. 1 vol.
- Belgium—Officiers du Génie de l'Armée Belge. 1 pam.
- Berlin Königliche Technische Hochschule. 1 pam.
- Boston—Dept. of Parks. 1 pam.
- Buffalo, Rochester & Pittsburg Ry. Co. 1 pam.
- Canadian Min. Inst. 1 vol.
- Central of Georgia Ry. Co. 1 pam.
- Chicago & Eastern Illinois R. R. Co. 1 pam.
- Chicago & North Western Ry. Co. 1 pam.
- Delaware & Hudson Co. 1 bound vol., 3 pam.
- Eckel, Edwin C. 1 pam.
- Eng. Assoc. of New South Wales. 1 bound vol.
- Engrs. Club of Philadelphia. 1 bound vol.
- Engrs. Club of St. Louis. 1 bound vol.
- Geographical Soc. of Philadelphia. 1 pam.
- Gila Valley, Globe & Northern Ry. Co. 1 pam.
- Great Britain—Patent Office. 2 vol., 5 pam.
- Greenhalge, F. T. 2 bound vol.
- Hannover Königliche Technische Hochschule. 1 pam.
- Humphrey, Richard L. 1 vol.
- India—Director of Railway Construction. 1 bound vol., 13 pam.
- India—Pub. Works Dept. 1 bound vol.
- Inst. of Civ. Engrs. 2 bound vol.
- Iron and Steel Inst. 1 bound vol.
- Kummer, F. A. 1 pam.
- Mass.—Highway Comm. 7 bound vol.
- Midland Ry. Co. 1 pam.
- Mining Inst. of Scotland. 1 vol.
- Municipal Engineering. 7 vol.
- N. Y. Pub. Lib. 360 bound vol., 194 vol., 220 pam.
- Parsons, Arthur L. 1 pam.
- Quick, A. M. 1 bound vol.
- Reissner, H. 2 pam.
- R. I.—Commr. of Dams and Reservoirs. 13 pam.
- St. John, N. B.—Water and Sewerage Board. 1 pam.
- Smithsonian Inst. 1 bound vol.
- Soc. Belge des Ingénieurs et des Industriels. 1 pam.
- Switzerland—Bureau Hydrométrique Fédéral. 1 vol.
- Tenn. Univ. 6 bound vol.
- Toledo, Ohio—Water-Works. 1 pam.
- U. S. Corps of Engrs. 42 specif.
- U. S. Geological Surv. 3 bound vol., 1 vol., 3 pam.
- U. S. Weather Bureau. 3 bound vol., 2 pam.
- Univ. of Ill. Agricultural Exper. Station. 4 pam.
- Whipple, George C. 1 pam.
- Wis. Free Lib. Comm. 1 vol.

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

BY PURCHASE.

Report on Prussian Railways. By Robert Collier. Presented to both Houses of Parliament by command of His Majesty, February, 1902. London, 1902.

SUMMARY OF ACCESSIONS.

From August 6th to September 9th, 1902.

Donations (including 92 duplicates).....	934
By purchase.....	1
Total.....	935

MEMBERSHIP.**ADDITIONS.****MEMBERS.**

		Date of Membership.
ANGIER, WALTER EUGENE		
Res. Engr., S. Ill. & Mo. Bridge Co., Thebes, { Assoc. M.	Sept. 7, 1892	
Ill. { M.	Sept. 3, 1902	
BARCROFT, FREDERICK THOMAS		
407 Ferguson Bldg., Detroit, Mich.....	Sept. 3, 1902	
CHILD, OLIVER W		
Chf. Engr., Stupp Bros. Bridge & Iron Co., { Assoc. M.	Sept. 5, 1900	
2301 South 7th St., St. Louis, Mo. { M.	Sept. 3, 1902	
COOMBS, STEPHEN ELBRIDGE		
510 Granite Blk., St. Louis, Mo.....	Sept. 3, 1902	
CREHORE, WILLIAM WILLIAMS	{ Assoc. M.	April 4, 1894
39 Cortlandt St., New York City. { M.	Sept. 3, 1902	
EIDLITZ, OTTO MARC		
489 Fifth Ave., New York City.....	Sept. 2, 1902	
LANSING, EDWARD TEN EYCK		
City Engr., Little Falls, N. Y.	Sept. 3, 1902	
VON SCHON, HANS AUGUST EVALD CONRAD		
Chf. Engr., Michigan Lake Superior Power Co., Sault		
Ste. Marie, Mich.	Sept. 2, 1902	

ASSOCIATE MEMBERS.

BARTRAM, GEORGE CORRIE		
Res. Engr., Phoenix Bridge Co., 153 Milk St., { Jun.	Jan. 31, 1899	
Boston, Mass. { Assoc. M.	Sept. 2, 1902	
BLAND, MILES CARLISLE		
Contr. Mgr., American Bridge Co. of New York, 418 Chamber of Commerce Bldg., Cleveland, Ohio.....	Sept. 3, 1902	
FAIN, JAMES RHEA		
Sub.-Insp., U. S. Navy Yard, League Island (Res., 2132		
South Broad St., Philadelphia), Pa	June 4, 1902	
GUERINGER, LOUIS AMEDEE		
Asst. Engr., I. & G. N. R. R., Italy, Tex.	May 7, 1902	
HUGHES, FRANCIS DEY		
Asst. Engr., Midland Bridge Co., Box 385, Kansas City,		
(Res., 220 South Liberty St., Independence), Mo.	Sept. 3, 1902	
HYDE, WILLIAM HERBERT	{ Jun.	April 30, 1901
Ravenna, Ohio. { Assoc. M.	June 4, 1902	
NOSKA, GEORGE ALBERT	{ Jun.	Mar. 31, 1896
33 East 17th St., New York City. { Assoc. M.	Sept. 3, 1902	
OSBOURN, HENRY VAN BUREN		
Ye Golden Swan, Mount Airy, Philadelphia, Pa.	Sept. 3, 1902	

		Date of Membership.
PECK, JOHN GATES	483 Hamilton St., Albany, N. Y.	Sept. 3, 1902
PITTS, THOMAS DORSEY	Chf. Draftsman, Tams, Lemoine & Crane, { Jun. Naval Archts., 52 Pine St., New York City. } Assoc. M.	Dec. 7, 1897 June 4, 1902
RIEGLER, LOUIS JOHN	417 Third St., Allegheny, Pa.	Sept. 3, 1902
THOMPSON, ARTHUR WEBSTER	Div. Engr., Pittsburg Div., B. & O. R. R., Cumberland, Md.	June 4, 1902

ASSOCIATE.

GAINES, FRANKLIN LINCOLN	Vice-Pres. and Gen. Supt. of Constr., Grand Rapids Bridge Co., 612 Pythian Temple, Grand Rapids, Mich.	April 1, 1902
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JUNIORS.

BARNES, WALTER EDMOND	45 Lincoln St., Malden, Mass.	May 6, 1902
McCULLOCH, ROBERT AUSTEN	80 Hillside Ave., Orange, N. J.	Sept. 2, 1902
MILLER, STANLEY ALFRED	With Nicol & Co., Pollock Bldg., Mobile, Ala.	Feb. 4, 1902
WACHTER, CHARLES LUCAS	96 Liberty St., New York City.	June 3, 1902
WARNER, GEORGE LITTLETON	2926 Fifteenth St., N. W., Washington, D. C.	April 1, 1902

CHANGES OF ADDRESS.

MEMBERS.

ABBOTT, ARTHUR VAUGHAN	8 Bridge St., New York City.
BEARDSLEY, JAMES WALLACE	U. S. Asst. Engr., Manila, Philippine Islands.
BOYNTON, GEORGE HERBERT	Asst. Engr., C., R. I. & P. Ry. Co., 610 Grand Central Passenger Station, Chicago, Ill.
BYLLESBY, HENRY MANSON	309 Merchants' Loan and Trust Bldg., Chicago, Ill.
COE, WILLIAM WATSON	Engr., Contr. Work, Branch Lines, N. & W. Ry. Co., Kenova, W. Va.
CUNNINGHAM, ANDREW OSWALD	Bridge Engr., The Wabash R. R. Co., St. Louis, Mo.
DUNHAM, CHARLES FREDERICK	Care, James Owen, Montclair, N. J.
FILLEY, HIEL HAMILTON	Res. Mgr. and Chf. Engr., The Guanajuato Power & Electric Co., Zamora, Michoacan, Mexico.
FRANCIS, GEORGE BLINN	Care, Westinghouse, Church, Kerr & Co., 8 Bridge St., New York City.

- GOULD, WILLIAM TILLOTSON.....Chf. Engr's Office, Brooklyn Heights R. R. Co., Franklin Trust Bldg., Brooklyn, N. Y.
- HANSEL, CHARLES.....Broad Exchange Bldg., New York City.
- HAZARD, SCHUYLER.....Res. Engr., Catawba Power Co., Rock Hill, S. C.
- JENKINS, WILLIAM DUNBAR.....Locating Engr., Bessemer & Lake Erie R. R. Co., Chicora, Butler Co., Pa.
- KIMBALL, GEORGE HENRY.....Chf. Engr., Pere Marquette R. R. Co., 72 Delaware Ave., Detroit, Mich.
- LINVILLE, JACOB HAYS.....Lansdowne, Pa.
- MARDEN, HENRY HERMAN, Jr.....515 Bedford Ave., Brooklyn, N. Y.
- MILLER, HARVEY COOPER.....68 Beaver St., New York City.
- MILLS, CHARLES MALON.....Prin. Asst. Engr., Subway & Elevated R. R. Constr., Philadelphia Rapid Transit Co. (Res., 4813 Beaumont St.), Philadelphia, Pa.
- MOSSCROP, ALFRED MITTON.....Vice Pres. and Engr., Structural Iron & Steel Co., Baltimore, Md.
- PAGET, EDMUND WINTER.....(Paget & Clark, Civ. Engrs. and Surveyors), Room 38, Washington Bldg., Portland, Ore.
- SCHENCK, ARCHIBALD ALEXANDER....Chf. Engr., Fremont, Elkhorn & Missouri Valley R. R. Co., Omaha, Neb.
- SCHERMERHORN, LOUIS YOUNGLOVE Pres., American Dredging Co., 510 Mariner and Merchant Bldg., Philadelphia, Pa.
- SMITH, HENRY DEWITT.....Res. Engr., Louisiana & Arkansas R. R. Co., Hope, Ark.
- SNYDER, GEORGE DUNCAN.....Care, C. M. Jacobs, 20 West 34th St., New York City.
- THOMAS, BENJAMIN FRANKLIN.....Louisa, Ky.
- WEBSTER, CHARLES EDWARD.....Cons. Engr., South Bethlehem, Pa.

ASSOCIATE MEMBERS.

- FISH, JOHN CHARLES LOUNSBURY....Box 20, Palo Alto, Cal.
- FOX, WALTER GORDON.....Batesville, Ark.
- FRAZEE, JOHN HATFIELD516 West 183d St., New York City.
- GREENE, FREDERICK STUART.....336 West 95th St., New York City.
- HARRINGTON, FERDINAND FINNEY... Bridge Dept., N. Y. C. & H. R. R. Co., Grand Central Station, New York City.
- HARTE, CHARLES RUFUS.....34 Elm St., Jamaica Plain, Mass.
- HARTWELL, HARRY.....53 East 87th St., New York City.
- HOUSTON, GAVIN NELSON.....University Park, Denver, Colo.
- HUESTIS, CHARLES CALVIN.....Gen. Mgr., The T. H. Riddle Constr. Co., North Mountain, W. Va.
- LAVIS, FRED.....Asst. Engr., N. Y., N. H. & H. R. R., Fall River, Mass.
- MARTIN, JAMES WILLIAM.....323 Quiney St., Pueblo, Colo.

- MOREY, RICHARD.....Gen. Mgr., Morey Engineering & Constr.
Co., 807 Carlton Bldg., St. Louis, Mo.
- PFEIFER, HERMAN JULIUS 509 Commonwealth Trust Bldg., St.
Louis, Mo.
- PHARR, HARRY NELSON.....Chf. Engr., St. Francis Levee Board,
Randolph Bldg., Memphis, Tenn.
- REID, HOMER AUSTIN.....Asst. Engr., Rapid Transit R. R. Comm.
(Res., 177 Columbia Heights), Brook-
lyn, N. Y.
- SWAAB, SOLOMON MARK.....Asst. Engr., Philadelphia Rapid Transit
Co., Philadelphia, Pa.
- WHEATLEY, ARTHUR CORNWALLIS....Res. Director and Gen. Mgr., The Trini-
dad Mining & Smelting Co., 2017 San
Pedro Ave., San Antonio, Texas.
- WILLS, ARTHUR JOHN.....Salisbury, N. C.

ASSOCIATE.

- ECKEL, EDWIN CLARENCE..... Asst. Geologist, U. S. Geological Survey,
Washington, D. C.

JUNIORS.

- BEACH, JAMES GEORGE Care, Geo. A. Fuller Co., North American
Bldg., Philadelphia, Pa.
- BISSELL, CLINTON TALCOTT.....7 St. James Pl, Brooklyn, N. Y.
- FORBES, HENRY DE BRETON Engr., H. E. Talbott & Co., Dayton,
Ohio.
- HORTON SANDFORD.316 Virginia Ave., Room 9, Indianapolis,
Ind.
- MORPHY, LUIS GONZAGA.....Asst. Engr., N.Y.C. & H. R. R. R., Room
14, Albany Station, Albany, N. Y.
- NEVILLE, COLONE WILL JACKSON.....Engr., American Bridge Co., 6032 Kim-
bark Ave., Chicago, Ill.
- UNDERWOOD, HOWARD WARREN.....232 Eagle St., North Adams, Mass.
- WHITE, FRANK GEORGE.....32 Third East St., Salt Lake City, Utah.

DEATHS.

- CLAPP, LORENZO RUSSELL.....Elected Member February 1st, 1888; died
August 13th, 1902.
- HANNAFORD, EDMUND PHILLIPS.....Elected Member September 18th, 1872;
died August 19th, 1902.
- WILSON, WILLIAM HASELL....Elected Honorary Member August 2d,
1892; died August 17th, 1902.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(August 6th to September 9th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal, Assoc. Eng. Soc.,* 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings, Eng. Club of Phila.,* 1122 Girard St., Philadelphia, Pa.
- (3) *Journal, Franklin Inst.,* Philadelphia, Pa., 50c.
- (4) *Journal, Western Soc. of Eng.,* Monadnock Block, Chicago, Ill.
- (5) *Transactions, Can. Soc. C. E.,* Montreal, Que., Can.
- (6) *School of Mines Quarterly, Columbia Univ.,* New York City, 50c.
- (7) *Technology Quarterly, Mass. Inst. Tech.,* Boston, Mass., 75c.
- (8) *Stevens Institute Indicator, Stevens Inst.,* Hoboken, N. J., 50c.
- (9) *Engineering Magazine, New York City,* 25c.
- (10) *Cassier's Magazine, New York City,* 25c.
- (11) *Engineering (London),* W. H. Wiley, New York City, 35c.
- (12) *The Engineer (London), International News Co.,* New York City, 35c.
- (13) *Engineering News, New York City,* 15c.
- (14) *The Engineering Record, New York City,* 12c.
- (15) *Railroad Gazette, New York City,* 10c.
- (16) *Engineering and Mining Journal, New York City,* 15c.
- (17) *Street Railway Journal, New York City,* 35c.
- (18) *Railway and Engineering Review, Chicago, Ill.,* 10c.
- (19) *Scientific American Supplement, New York City,* 10c.
- (20) *Iron Age, New York City,* 10c.
- (21) *Railway Engineer, London, England,* 25c.
- (22) *Iron and Coal Trades Review, London, England,* 25c.
- (23) *Bulletin, American Iron and Steel Assoc., Philadelphia, Pa.*
- (24) *American Gas Light Journal, New York City,* 10c.
- (25) *American Engineer, New York City,* 20c.
- (26) *Electrical Review, London, England.*
- (27) *Electrical World and Engineer, New York City,* 10c.
- (28) *Journal, New England Water-Works Assoc., Boston, \$1.*
- (29) *Journal, Society of Arts, London, England,* 15c.
- (30) *Annales des Travaux Publics de Belgique, Brussels, Belgium.*
- (31) *Annales de l'Assoc. des Ing. Sortis des Ecole Spéciales de Gand, Brusseis, Belgium.*
- (32) *Mémoires et Compte Rendu des Travaux, Soc. Ing. Civ. de France, Paris, France.*
- (33) *Le Génie Civil, Paris, France.*
- (34) *Portefeuille Économique des Machines, Paris, France.*
- (35) *Nouvelles Annales de la Construction, Paris, France.*
- (36) *La Revue Technique, Paris, France.*
- (37) *Revue de Mécanique, Paris, France.*
- (38) *Revue Générale des Chemins de Fer et des Tramways, Paris, France.*
- (39) *Railway Master Mechanic, Chicago, Ill.,* 10c.
- (40) *Railway Age, Chicago, Ill.,* 10c.
- (41) *Modern Machinery, Chicago, Ill.,* 10c.
- (42) *Transactions, Am. Inst. Elec. Engrs., New York City,* 50c.
- (43) *Annales des Ponts et Chaussées, Paris, France.*
- (44) *Journal, Military Service Institution, Governor's Island, New York Harbor,* 50c.
- (45) *Mines and Minerals, Scranton, Pa.,* 20c.
- (46) *Scientific American, New York City,* 8c.
- (47) *Mechanical Engineer, Manchester, England.*
- (48) *Proceedings, Eng. Soc. W. Pa.,* 410 Penn Ave., Pittsburg, Pa., 50c.
- (49) *Transactions, Mining Inst. of Scotland, London and Newcastle-upon-Tyne.*
- (50) *Municipal Engineering, Indianapolis, Ind.,* 25c.
- (51) *Proceedings, Western Railway Club, 225 Dearborn St., Chicago, Ill.,* 25c.
- (52) *American Manufacturer and Iron World, 59 Ninth St., Pittsburg, Pa.*
- (53) *Minutes of Proceedings, Inst. C. E., London, England.*
- (54) *Power, New York City, 20c.*
- (55) *Official Proceedings, New York Railroad Club, Brooklyn, N. Y.,* 15c.
- (56) *Journal of Gas Lighting, London, England,* 15c.
- (57) *Cement and Engineering News, Chicago, Ill.,* 25c.

LIST OF ARTICLES.

Bridge.

- American Workshop Methods in Steel Construction. (Pencoyd Bridge Works).* Henry Bridges Molesworth, M. Inst. C. E. (63) Vol. cxlviii.
 Masonry and Steel Arches on the Chicago, Milwaukee & St. Paul.* (49) Aug. 8.
 Boulder-Faced Melan Arch Bridge. National Park, Washington, D. C.* W. J. Douglas. (13) Aug. 14.
 The Rock Creek Concrete-Steel Arch, Washington.* (14) Aug. 16.
 A New Bridge over the Fraser River at New Westminster, British Columbia.* (15) Aug. 29.
 Heavy Concrete Arches.* (14) Aug. 30.
 Concrete-Steel Bridges.* D. B. Linton. (60) Sept.
 The Bascule Bridge at West Division Street, Chicago.* (20) Sept. 4.

Electrical.

- The Testing of Combined Steam-Engine and Dynamo Sets.* Edwin Hartree Rayner, Stud. Inst. C. E. (63) Vol. cxlviii.
 The Telephonic Status Quo. Arthur Vaughan Abbott. (42) Apr.
 Telephone Rates from an Engineer's Viewpoint. Franz J. Dommerque. (42) Apr.
 Power Consumption of Elevators Operated by Alternating and Direct Current Motors. George F. Sever. (42) Apr.
 Telpherage.* Charles M. Clark. (42) Apr.
 The New Generating Plants of the Niagara Falls Power Company.* H. W. Buck. (42) May.
 Notes on the Theory of the Synchronous Motor, with Special Reference to the Phenomenon of Surging. Charles Proteus Steinmetz. (42) May.
 A Method of Compounding Alternating Current Generators and Motors, Direct Current Generators, Synchronous Motor-Generators and Synchronous Converters.* Frank George Baum. (42) May.
 Formula for Calculating the Electromotive Force at any Point of a Transmission Line for Alternating Current. M. Leblanc. (42) May.
 An Experiment with Single-Phase Alternators on Polyphase Circuits. C. O. Mailloux. (42) May.
 Energy Loss in Commercial Insulating Materials when Subjected to High Potential Stress. Charles Edward Skinner. (42) May.
 Report of the Committee on Standardization. American Institute of Electrical Engineers. (42) May.
 The Determination of Alternator Characteristics. Louis A. Herdt. (42) May.
 A New Curve Tracing Instrument. Robert B. Owens. (42) May.
 The Function of Shunt and Series Resistance in Lightning Arresters. Percy H. Thomas. (42) May.
 The Electrostatic Wattmeter in Commercial Measurements. Miles Walker. (42) May.
 Storage Batteries in Mills and Factories. E. Vail Stebbins. (1) July.
 Newcastle and District Electric Lighting Company's Power Station.* W. D. Hunter. (Paper read before the Inst. of Mech. Engrs.) (11) Aug. 1.
 Some Suggestions with regard to Electric Motor Installations. Alfred H. Mayes. (26) Aug. 1.
 The Electric-Supply Power Station at Neptune Bank, Newcastle-upon-Tyne.* W. B. Woodhouse, Assoc. M. Inst. M. E. (Paper read before the Inst. of Mech. Engrs.) (11) Aug. 1.
 The Correct Type of Engine for Large Generating Stations. A. A. Day. (Paper read before the Incorporated Municipal Electrical Assoc.) (47) Aug. 2.
 The Old and the New Electrical Theory. Alex. P. Trotter. (26) Serial beginning Aug. 8.
 Missouri River Power Company's 50,000-Volt Transmission Plant.* A. W. Clapp. (27) Aug. 9.
 Electric Lighting and Power in San Francisco.* (26) Aug. 15.
 Direct Measurement of Wattless Power. Budd Frankenfield. (27) Aug. 16.
 High-Tension Circuit Safeguards.* Joseph Martin Roman. (27) Aug. 16.
 High Tension Continuous-Current Systems.* A. S. Barnard. (Paper read before the Incorporated Municipal Elec. Assoc.) (47) Aug. 16.
 Safety in Elevators. O. F. Shepard. (27) Aug. 16.
 The Manufacture of an Incandescent Lamp.* (27) Aug. 16.
 The Largest Electrical Transmission of Water Power in Massachusetts.* Alton D. Adams. (27) Aug. 16.
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EMIL KUICHLING,
MORDECAI T. ENDICOTT
EDWARD C. CARTER,
FRANK C. OSBORN.

Term expires January,

1905:

RICHARD S. BUCK,
GEORGE H. PEGRAM,
WILLIAM J. WILGUS,
WILLIAM JACKSON,
EDMUND F. VAN HOESEN,
JAMES L. FRAZIER.

Assistant Secretary, T. J. McMINN.

Standing Committees.

THE PRESIDENT OF THE SOCIETY IS *ex-officio* MEMBER OF ALL COMMITTEES.

On Finance:

JOSIAH A. BRIGGS,
G. H. BENZENBERG,
GEORGE F. SWAIN,
RICHARD S. BUCK,
WILLIAM J. WILGUS.

On Publications:

JOHN F. O'ROURKE,
GEORGE H. PEGRAM,
THOMAS H. JOHNSON,
JOSEPH RAMSEY, JR.,
FRANK C. OSBORN.

On Library:

HENRY S. HAINES,
CHARLES C. SCHNEIDER,
MORDECAI T. ENDICOTT,
EMIL KUICHLING,
CHARLES WARREN HUNT.

Special Committees.

ON UNIFORM TESTS OF CEMENT:—George S. Webster, George F. Swain, Alfred Noble, W. B. W. Howe, Louis C. Sabin, S. B. Newberry, Clifford Richardson, Richard L. Humphrey, F. H. Lewis.

ON RAIL SECTIONS:—G. Bouscaren, C. W. Euchholz, S. M. Felton, Robert W. Hunt, John D. Isaacs, Richard Montfort, H. G. Prout, Joseph T. Richards, Percival Roberts, Jr., George E. Thackray, Edmund K. Turner, William R. Webster.

The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK.

TELEPHONE NUMBER, - - - - 533 Columbus.
CABLE ADDRESS, - - - - "Ceas, New York."

AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

October 1st, 1902.—The meeting was called to order at 8.40 p. m., Joseph M. Knap, Treasurer, Am. Soc. C. E., in the chair; Assistant Secretary T. J. McMinn acting as Secretary; and present, also, 76 members and 7 visitors.

The minutes of the meetings of September 3d and 17th, 1902, were approved as printed in *Proceedings* for September, 1902.

A paper by Theron A. Noble, M. Am. Soc. C. E., entitled "The Flow of Water in Wood Pipes," was presented by the Acting Secretary, who also read communications on the subject from Messrs. Ernest W. Schoder and A. V. Saph. The paper was discussed orally by Messrs. Gardner S. Williams and Rudolph Hering.

Ballots for membership were canvassed, and the following candidates were elected:

AS MEMBERS.

- PERCY ALLAN, Sydney, N. S. W., Australia.
GEORGE JOSEPH BELL, Carlisle, England.
GEORGE HOLLAND BINKLEY, Chicago, Ill.
GEORGE BOWERS, Lowell, Mass.
FRANCIS ELIHU CRANE, Amsterdam, N. Y.
HARVEY FARRINGTON, Croton-on-Hudson, N. Y.
JULIAN WAY KENDRICK, Birmingham, Ala.
CHARLES HENRY KLUEGEL, Honolulu, Hawaiian Islands.
THOMAS HOGGAN MATHER, Syracuse, N. Y.
FRANK BERRY SANBORN, Tufts College, Mass.
FREDERICK EDUARD SCHALL, South Bethlehem, Pa.
GEORGE WASHINGTON SUBLETTE, Minneapolis, Minn.
FRED THOMPSON, Norfolk, Va.
CHARLES HUNTER WEST, Greenville, Miss.
ROScoe CYPRIAN YOUNG, Iowa Falls, Iowa.

AS ASSOCIATE MEMBERS.

- RALPH ALBREE, Allegheny, Pa.
RICHARD WILLIAM CARTER, Leavenworth, Kans.
ALGER ADAMS CONGER, Sault Ste. Marie, Mich.
DUDLEY TIBBITS CORNING, Tomhannock, N. Y.
WASHINGTON RIGHTER CRAIG, St. Marys, Pa.
FRANK OLIVER DUFOUR, Cincinnati, Ohio.
GEORGE HARRISON FENKELL, Erie, Pa.
FREDERICK LUTHER FORD, Hartford, Conn.
RAY ELLIOTT GRISWOLD, Port of Spain, Trinidad, B. W. I.
LOUIS WELLS HALL, Tuscaloosa, Ala.
FREDERICK EUGENE LANE, Brooklyn, N. Y.
NORMAN BANKS LIVERMORE, San Francisco, Cal.
DON ALEXANDER MACCREA, Guthrie, Okla. T.
LEWIS HENRY MATTAIR, Matanzas, Cuba.
HENRY FRANCIS NICHOLS, Adelaide, South Australia.
EDMUND PAYTON RAMSEY, Brooklyn, N. Y.
CARL LOUIS EDUARD SCHENK, Walkers Mills, Pa.
WILLIAM FREDERICK STEFFENS, New York City.
WARREN AYRES TYRRELL, St. Louis, Mo.

The Acting Secretary read the list of nominees* presented by the Nominating Committee for the offices to be filled at the next Annual Meeting, January 21st, 1903.

* See page 292.

The Acting Secretary announced the death of CHARLES HAZLEHURST LATROBE; elected Member, November 16th, 1870; died September 19th, 1902.

Adjourned.

October 15th, 1902.—The meeting was called to order at 8.40 p. m., Emil Kuehling, Director, Am. Soc. C. E., in the chair; Chas. Warren Hunt, Secretary; and present, also, 83 members and 15 guests.

A paper, entitled "The Protection and Improvement of Foreshores by the Utilization of Tidal and Wave Action," by R. G. Allanson-Winn, M. Inst. C. E. I., was presented by the Secretary, who also read communications on the subject from L. M. Haupt, M. Am. Soc. C. E., and the author.

The paper was discussed orally by Messrs. Rudolph Hering and E. B. Thomson.

The Secretary announced the election of the following candidates by the Board of Direction on October 7th, 1902:

AS ASSOCIATE.

MERRILL WATSON, New York City.

AS JUNIORS.

EDWARD MAGUIRE ADAMS, Washington, D. C.
ALEXANDER FLOYD ARMSTRONG, Ogdensburg, N. Y.
HAROLD JAMES MANNING BAKER, Port Townsend, Wash.
HOWARD EDWARD BOARDMAN, New York City.
OLIVER CROMWELL EDWARDS, Jr., Steubenville, Ohio.
JOHN WARREN DU BOIS GOULD, Yonkers, N. Y.
LEWIS TUSTLER HANEY, St. Elmo, Va.
EDWARD CRESWELL HEALD, Phoenixville, Pa.
STIRLING BRYANT HILL, Ithaca, N. Y.
ALEXANDER RIEMAN HOLLIDAY, New Castle, Pa.
SHIRLEY CLARKE HULSE, Ithaca, N. Y.
RALPH CHARLES KIMBALI, Evart, Mich.
KIEFFER LINDSEY, Columbus, Ga.
HARRY PEAKE McDONALD, Jr., Jersey City, N. J.
JOHN HENRY MADDEN, New York City.
DAVID HEYDORN RAY, New York City.
RALPH HARVEY SABIN, Sherman, Tex.
CHARLES HERMAN SNYDER, Johnstown, Pa.
WILLIAM PURVES TAYLOR, Philadelphia, Pa.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

September 2d, 1902.—Vice-President Schneider in the chair; T. J. McMinn acting as Secretary; and present, also, Messrs. Briggs, Osborn, Pegrani and Seaman.

Reconsideration ballots were canvassed, and Marc Otto Eidlitz and Hans August Evald Conrad von Schou were declared elected Members of the Society, and George Corrie Bartram was declared elected an Associate Member of the Society.

Applications were considered and other routine business transacted.

Seven candidates for Junior were elected.*

Adjourned.

October 7th, 1902.—Vice-President Haines in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Croes, Frazier, Jackson, O'Rourke, Osborn, Schneider, Seaman, Van Hoesen and Wilgus.

The time and place for holding the next Annual Convention was considered, and the Chairman authorized to appoint a Committee to report to the Board on the matter.

A proposed change in the form of ballots for the election of members was considered.

The appointment of the following Committee, to award prizes for the year ending with the *Transactions* for July, 1902, was announced: H. M. Chittenden, Bernard R. Green, L. F. G. Bouscaren.

Notice was received from the Executor of the will of the late Herbert Steward, Assoc. Am. Soc. C. E., that he was prepared to pay Mr. Steward's bequest to the Society. The extract from Mr. Steward's will, making this bequest, is as follows:

"I give and bequeath to the American Society of Civil Engineers the sum of two thousand dollars, to be known as the Herbert Steward Library Fund. The fund shall be invested and utilized as the Board of Direction of said Society may elect, provided it shall secure a yearly income; which income shall be entirely expended each year for the purchase of books, maps, or apparatus suitable for the Library of said Society, or for the purpose of promulgating engineering information. I also give to said Society such technical books from my library as may be selected by the Secretary of the Society."

The proper steps were taken to accept the legacy under the terms of the will.

A special subscription of £10 to the Library Fund of the Society from Sir Benjamin Baker, Hon. M. Am. Soc. C. E., was received, and acknowledged with thanks.

* See page 265, September, 1902, *Proceedings*.

The following resignation was received and accepted: Harry Alexander Gillis, Assoc. M. Am. Soc. C. E.

Applications were considered and other routine business transacted.

One candidate for Associate and nineteen for Junior were elected.*
Adjourned.

* See page 289.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

LIST OF NOMINEES FOR THE OFFICES TO BE FILLED AT THE ANNUAL MEETING, JANUARY 21ST, 1903.

The following list of nominees for the offices to be filled at the Annual Meeting, January 21st, 1903, received from the Nominating Committee, was presented to the Board of Direction at its meeting on June 3d, 1902, and announced at the meeting of the Society on October 1st, 1902. The list has already been mailed to all Corporate Members:

For President, to serve one year.

ALFRED NOBLE, New York City.

For Vice-Presidents, to serve two years.

JAMES D. SCHUYLER, Los Angeles, Cal.

L. F. G. BOUSCAREN, Cincinnati, Ohio.

For Treasurer, to serve one year.

JOSEPH M. KNAP, New York City.

For Directors, to serve three years.

JOSEPH O. OSGOOD, Plainfield, N. J., representing District No. 1.

ALFRED CRAVEN, Yonkers, N. Y., representing District No. 1.

GEORGE S. DAVISON, Pittsburg, Pa., representing District No. 4.

HUNTER McDONALD, Nashville, Tenn., representing District No. 6.

E. C. LEWIS, Nashville, Tenn., representing District No. 6,

ELWOOD MEAD, Cheyenne, Wyo., representing District No. 7.

PROPOSED AMENDMENT TO THE CONSTITUTION.

The following proposed amendment to the Constitution has been received by the Secretary, and has been sent to all Corporate Members of the Society. In accordance with the provisions of Section 2 of Article IX of said Constitution, it will be considered at the Annual Meeting, January 21st, 1903:

Amend Article III of the Constitution as follows:

Section 2, first line, after the words "Society as" strike out the words "Member or as Associate" and insert the words "a Corporate"; second line, after the word "to" strike out the words "either grade of."

Section 2, Art. III, will then read, "An application for admission to the Society as a Corporate Member, or for transfer from any other grade to Corporate Membership shall embody," the rest of the section standing as now.

Section 3, third line, after the word "membership" strike out the words "in any grade," and after the word "transfer" strike out the words "from one grade to another"; twelfth line, for the word "may" substitute the word "shall." The section will then read as follows:

"At stated periods, to be determined by the Board of Direction, there shall be issued to each member in any grade whose address is known, a list of all new applications received for membership or for transfer, which list shall be dated and shall contain a concise statement of the record of each applicant and the names of the references in the case of Corporate Member, and endorsers in the case of Associate, Junior or Fellow, with a request that members transmit to the Board any information in their possession which may affect the disposition of the applications. Not less than twenty days after the issue of such list, the Board of Direction shall consider these applications, together with any information in regard to the applicants that may have been received; may make further inquiries, if deemed expedient; shall classify the applicant with his consent, and on applications for Corporate Membership may direct a ballot."

Proposed by { H. G. PROUT,
G. S. WILLIAMS,
ALF. P. BOLLER,
GEO. Y. WISNER,
GEO. F. SWAIN.

MEETINGS.

Wednesday, November 5th, 1902.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and a paper by Isaac Harby, Jun. Am. Soc. C. E., entitled "The Footbridge for Building the Cables of The New East River Bridge," will be presented for discussion.

This paper was printed in the *Proceedings* for September, 1902.

Wednesday, November 19th, 1902.—8.30 p. m.—At this meeting a paper by J. Francis Le Baron, M. Am. Soc. C. E., entitled "An Alternative Line for the Nicaragua Canal, and a Proposed New Method of Dam Construction," will be presented for discussion.

This paper is printed in this number of *Proceedings*.

ACCESSIONS TO THE LIBRARY.

From September 10th to October 7th, 1902.

DONATIONS.*

LE CANAL DE SUEZ.

Par Voisin Bey. Paper, 9 x 6 ins., 3 vol. and Atlas. Paris, Ch. Dunod, 1902.

The Contents are: Historique Administratif et Actes Constitutifs de la Compagnie—Période des Études et de la Construction, 1854 à 1869; Période de l'Exploitation, 1^{re} de 1870 à 1882; Période de l'Exploitation, 2^e de 1883 à 1902.

CAMBRIA STEEL.

A Handbook of Information Relating to Structural Steel Manufactured by the Cambria Steel Co., Containing Useful Tables, Rules, Data and Formulae for the Use of Engineers, Architects, Builders and Mechanics. Leather, 7 x 4½ ins., 10 + 428 pp., illus. Philadelphia, Cambria Steel Co., 1901. \$1.00.

The preface states that the present edition contains all the data of the preceding one, which, however, has been corrected where necessary and revised to conform to the present practice of the Company. A large amount of new matter has been added, including drawings of new sections of T-bars, special channels and special angles, with tables of weights, dimensions and properties therefor. Other new matter has also been introduced, the principal items of which are as follows: Drawings and tables relating to new standard connection-angles for beams and channels, giving location and other data for sections of different depths framing opposite each other; tables of safe loads for beam columns, latticed channel columns, plate and channel columns, plate girders and beam box-girders; also tables of dimensions of Z-bar columns, latticed channel columns and plate and channel columns. There is an index of eleven pages.

LES GAZOGÈNES.

Par Jules Deschamps. Paper, 10 x 6½ ins., 436 pp., illus. Paris, Ch. Dunod, 1902. 15 fr.

The Contents are: La définition, l'utilité et la variété des gazogènes; La combustion; Les combustibles; La gazification des combustibles; Le pouvoir calorifique; Les appareils de distillation; Les gazogènes dits de gaz à l'eau; Les gazogènes Siemens; Les gazogènes Dowson; Les gazogènes à combustion renversée; Les gazogènes à deux cuves; Les gazogènes spéciaux; Les appareils auxiliaires; Récupérateurs et régénérateurs; Application des gazogènes à la production de la force motrice.

Gifts have also been received from the following:

Alaska Treadwell Gold Min. Co.	2 pam.	Eckel, Edwin C.	1 pam.
Am. Inst. of Min. Engrs.	14 pam.	Fidelity & Casualty Co.	1 pam.
Atchison, Topeka & Santa Fé Ry. Co.	1 pam.	Glasgow & South-Western Ry. Co.	1 pam.
Atlanta, Knoxville & Northern Ry. Co.	1 pam.	Gray, William G.	1 pam.
Bensel, J. A.	1 bound vol.	Great Britain—Patent Office.	1 vol., 4 pam.
Boston & Maine R. R. Co.	1 pam.	Herschel, Clemens.	19 bound vol.
Bradley, C. W.	12 pam.	Heyland, A.	1 pam.
Breuchand, Jules.	1 phot.	Hite-Smith, Van D.	2 pam.
Bryson, Andrew.	1 phot.	Hocking Valley Ry. Co.	3 pam.
Cairns, Robert A.	3 pam.	Illinois Central R. R. Co.	1 pam.
Chicago Great Western Ry. Co.	1 pam.	Iron and Steel Inst.	1 bound vol.
Chicago, Indianapolis & Louisville Ry. Co.	1 pam.	Jacksonville, Fla.—Board of Trustees for Water-Works and Improvement Bonds.	1 pam.
City Club of N. Y.	1 bound vol.	Linton, Harvey.	1 bound vol.
Colorado & Southern Ry. Co.	2 pam.	Madras, India—Pub. Works Dept.	1 bound vol.
Colorado Midland Ry. Co.	1 pam.	Maine Central R. R. Co.	1 pam.
Consolidated Lake Superior Co.	1 pam.	Mich. Coll. of Mines.	3 vol.
Corthell, E. L.	2 specif.	Minneapolis, St. Paul & Sault Ste. Marie Ry. Co.	1 pam.
Dayton, Ohio—Water-Works.	2 pam.		
Dyckerhoff & Söhne.	2 pam.		

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

Missouri, Kansas & Texas Ry. Co.	1 pam.	U. S. Bureau of Navigation.	3 bound vol.
Nashville, Chattanooga & St. Louis Ry. Co.	1 pam.		13 pam.
N. Y. City Univ.	1 bound vol., 9 vol., 1 pam.	U. S. Coast and Geodetic Surv.	1 bound vol.
Nicholson, G. B.	1 pam.	U. S. Corps of Engrs.	25 specif.
Ockerson, J. A.	1 pam.	U. S. Geological Surv.	1 pam.
Paine, Charles.	10 vol., 1 pam.	U. S. Office of Naval Intelligence.	1 vol.
Pawtucket, R. I.—Dept. of Pub. Works.	1 pam.	U. S. Ordnance Office.	1 bound vol., 2 pam.
Philadelphia, Pa.—Mayor.	3 bound vol.	U. S. Patent Office.	1 vol.
Princeton Univ.	1 vol.	U. S. War Dept.	1 bound vol., 10 vol.
St. Xavier, Felix.	1 pam.	Univ. of Ill. Agricultural Exper. Station.	1 pam.
Toledo, Peoria & Western Ry. Co.	1 pam.		

BY PURCHASE.

Weser und Ems, ihre Stromgebiete und ihre wichtigsten Nebenflüsse. Eine hydrographische, wasserwirtschaftliche und wasserrechtliche Darstellung. Auf Grund des Allerhöchsten Erlasses vom 28. Februar, 1892, im Auftrage des preussischen Wasser-Ausschusses herausgegeben von H. Keller. 5 vols. and Atlas. Berlin, Dietrich Reimer, 1901.

SUMMARY OF ACCESSIONS.

From September 10th to October 7th, 1902.

Donations (including 12 duplicates)	203
By Purchase	6
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Total	209

MEMBERSHIP.**ADDITIONS.****MEMBERS.**

		Date of Membership.
BOWERS, GEORGE		
City Engr., 359 Westford St., Lowell, Mass.....		Oct. 1, 1902
COHEN, FREDERICK WILLIAM		
Engr. of Erection, Bridge and Constr. Dept., { Assoc. M.	Feb. 3, 1897	
The Pennsylvania Steel Co., Steelton, Pa.... } M.	Sept. 3, 1902	
CRANE, FRANCIS ELIHU		
City Eng'., Amsterdam, N. Y.....		Oct. 1, 1902
ELDRIDGE, GRIFFITH MORGAN	{ Assoc. M.	June 1, 1892
Mgr., Eldridge Drug Stores, Americus, Ga... } M.	Sept. 3, 1902	
FARRINGTON, HARVEY	{ Jun.	June 19, 1891
Cons. Engr., 115 Broadway, New York { Assoc. M.	Feb. 6, 1895	
City.....	} M.	Oct. 1, 1902
McDONALD, WILLIAM NAYLOR		
Supt. of Streets and Parks, Tacon St. No. 3, Havana, Cuba		Sept. 3, 1902
YOUNG, ROSCOE CYPRIAN		
Chf. Engr., Des Moines, Iowa Falls & Northern Ry., Iowa Falls, Ia		Oct. 1, 1902

ASSOCIATE MEMBERS.

ALBREE, RALPH		
1115 Market St. (Res., 1112 Western Ave.), { Jun.	Oct. 4, 1898	
Allegheny, Pa.....	} Assoc. M.	Oct. 1, 1902
ASHBRIDGE, RICHARD I. DOWNING		
Room 710, City Hall, Philadelphia (Res., East Downingtown, Chester Co.), Pa.....		Sept. 3, 1902
CARTER, RICHARD WILLIAM		
Asst. Engr., Mo. Valley Bridge & Iron Works (Res., 1000 South 4th St.), Leavenworth, Kans.....		Oct. 1, 1902
CONGER, ALGER ADAMS		
Asst. Engr., Michigan Lake Superior Power Co., Sault Ste. Marie, Mich.....		Oct. 1, 1902
CORNING, DUDLEY TIBBITS		
Asst. Engr., Troy Water-Works Extension, Tomhannock, N. Y.....		Oct. 1, 1902
CRAIG, WASHINGTON RIGHTER		
Res. Engr., P. S. & N. R. R. Co., Bolivar, { Jun.	May 1, 1894	
N. Y.....	} Assoc. M.	Oct. 1, 1902
LANE, FREDERICK EUGENE		
Res. Engr., Div. 4, Atlantic Ave. Impvt., L. I. R. R., 5 Hanson Pl. (Res., 1037 Bergen St.), Brooklyn, N. Y..		Oct. 1, 1902

		Date of Membership.
MAC CREA, DON ALEXANDER		
Div. Engr., C., O. & G. R. R., Guthrie, Okla. T.	{ Jun. Assoc. M.	May 2, 1899 Oct. 1, 1902
PETTEE, EUGENE EVERETT		
269 Lowell Ave., Newtonville, Mass.		Sept. 3, 1902
RICKET, JAMES WALTER		
508 South First St., Minneapolis, Minn.		Sept. 3, 1902
ROBERTS, GEORGE THOMAS		
Asst. Engr., Bureau of Eng., 13 City Hall (Res., 941 Elk St.), Buffalo, N. Y.		Sept. 3, 1902
SANDERS, FRANCIS NICOLL		
235 State St., Albany, N. Y.		Sept. 3, 1902
SCHENK, CARL LOUIS EDUARD		
Box 82, Walkers Mills, Pa.		Oct. 1, 1902
TURNEAURE, FREDERICK EUGENE		
Prof. of Bridge and San. Eng., Univ. of Wis., Madison, Wis.	{ Assoc. M.	Aug. 31, 1897 June 4, 1902
TYRELL, WARREN AYRES		
Care, Maule, Hannah & Co., 1416 Chemical Bldg., St. Louis, Mo.	{ Jun. Assoc. M.	Oct. 2, 1900 Oct. 1, 1902
WIGGIN, ERNEST WOODBURY		
Asst. Bridge Engr., N. Y., N. H. & H. R. R., New Haven, Conn.	{ Jun. Assoc. M.	May 5, 1896 May 7, 1902
WRIGHT, MOSES HANNIBAL		
Roadmaster, L. & N. R. R., Nashville, Tenn.	{ Jun. Assoc. M.	Jan. 2, 1900 Sept. 3, 1902

ASSOCIATE.

STEARNS, FRED LINCOLN		
52 West 126th St., New York City		June 3, 1902
WATSON, MERRILL		
Mgr. and Treas., The N. Y. Expanded Metal Co., Broadway, New York City		Oct. 7, 1902

JUNIORS.

GETCHELL, WILLIAM STEWART		
Care, W. M. Porter, Asst. Chf. Engr., Colo. Fuel & Iron Co., Denver, Colo.		Sept. 2, 1902
RAY, DAVID HEYDORN		
Archt. and Civ. Engr., 555 West 182d St., New York City		Oct. 7, 1902
ULLMANN, JOHN GEORGE		
Asst. Engr., Buffalo Div., Erie R. R., Buffalo, N. Y.		April 1, 1902

CHANGES OF ADDRESS.

MEMBERS.

AUCHINCLOSS, WILLIAM S.	.....	45 West 20th St., New York City.
BALLARD, ROBERT	.....	35 Wood Lane, Shepherd's Bush, London, W., England.

- BARBER, WILLIAM DAVIS.....Asst. Engr. in Chg., Div. of Pumping Station, Constr. and Repairs, Dept. of Public Works (Res., 1639 Roscoe St.), Chicago, Ill.
- BISBEE, FRED MILTON.....Gen. Mgr., Los Angeles Land & Water Co., Los Angeles, Cal.
- CHILD, STEPHEN.....Woodland Park Hotel, Auburndale, Mass.
- DEWITT, PHILIP HOFFECKER.....8 Arlington Road, Cranford, N. J.
- ELLIS, GEORGE EZRA.....Western Agt., Pneumatic Signal Co., 1032 Monadnock Blk., Chicago, Ill.
- GRANT, EMERSON WARREN.....Eng. Dept., A., T. & S. F. Ry., 1014 West 13th St., Topeka, Kans.
- GREENE, FRANCIS VINTON.....33 East 30th St., New York City.
- GRESHAM, ROBERT HALL.....San Angelo, Tex.
- GRIMM, CARL ROBERT.....131 Carnegie Hall, New York City.
- HARLOW, GEORGE RICHARDSON.....620 Wood St., Wilkinsburg, Pa.
- HAZLEHURST, GEORGE BLAGDEN.....376 East Colorado St., Pasadena, Cal.
- HYDE, ABRAHAM LINCOLN.....Instr. in Civ. Eng., Lehigh Univ., 102 South New St., Bethlehem, Pa.
- IRWIN, JAMES CLARK.....Engr. of Signals, N. Y. C. & H. R. R., Grand Central Station, New York City (Res., 65 Glenwood Ave., Yonkers, N. Y.).
- JAQUES, WILLIAM HENRY.....186 Devonshire St., Boston, Mass.
- JENKINS, WILLIAM DUNBAR.....Div. Engr., Western Allegheny R. R., Chicora, Butler Co., Pa.
- KAUFMAN, GUSTAVE.....Engr. and Contr., 561 Franklin Ave., Brooklyn, N. Y.
- LABELLE, HENRY FRANCIS.....Civ. and Hydr. Engr., 1110 Betz Bldg., Philadelphia, Pa.
- LE BARON, JOHN FRANCIS.....Chf. Engr., American Honduras Co. and Patuca Plantation Co., 1329 Williamson Bldg., Cleveland, Ohio.
- MOSSCROP, ALFRED MITTON.....Vice Pres. and Mgr., Baltimore Bridge Co., Bush St. and B. & O. R. R., Baltimore, Md.
- NORTHRUP, HERBERT FRANKLIN.....Guilford, Ind.
- PARKER, MAURICE STILES.....Engr. and Contr., Arlington, Tex.
- RAYMOND, CHARLES WALKER.....Lt. Col., Corps of Engrs., U. S. A., 815 Witherspoon Bldg., Philadelphia, Pa.
- RIFFLE, ALBERT STANLEY.....Care, San Domingo Gold Mining Co., Angels Camp, Calaveras Co., Cal.
- RIPLEY, HENRY CLAY.....Cons. Engr. for River and Harbor Impvts. and Marine Constr., 832 East University Ave., Ann Arbor, Mich.
- RUGGLES, WILLIAM BURROUGHS.....Chf. Engr., Sandy Valley & Elkhorn Ry. Co., Pikeville, Ky.
- SIMS, ALFRED VARLEY.....Iowa City, Iowa.

- THOMPSON, ELLIS DUNN.....U. S. Asst. Engr., 815 Witherspoon Bldg., Philadelphia, Pa.
- TOMLINSON, ALFRED THOMAS.....Lock Drawer "H," Albion, N. Y.
- WALLACE, JOHN FINDLEY.....Gen. Mgr., I. C. R. R., 1 Park Row (Res., 4427 Greenwood Ave.), Chicago, Ill.
- WEBB, GEORGE HERBERT.....Room 7, Arcade, Springfield, Ohio.
- WEBER, ALEXANDER HAMILTON.....U. S. Asst. Engr., Custom House, New Orleans, La.
- WHITE, HENRY FISHER.....Engr., M. of W., C., R. I. & P. Ry., Room 605, Grand Central Station, Chicago, Ill.
- WOERMANN, JOHN WILLIAM.....Res. Engr., Illinois and Mississippi Canal, Milan, Ill.

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- ARCHER, STEVENSON, Jr.....Res. Engr., Mo. Pac. Ry., Tallulah, La.
- ARMITAGE, GEORGE WASHINGTON....Office of Constr. Quartermaster, U. S. A. U. S. Custom House and Post Office Bldg., Chattanooga, Tenn.
- BARNETT, ROBERT CRARY.....3023 East 20th St., Kansas City, Mo.
- BELLOWS, OSCAR FRANCIS.....Supt. of Constr., Q. M. Dept., U. S. A., Fort Ontario, Oswego, N. Y.
- BISHOP, WILLIAM ISRAELCare, Pittsburg Reduction Co., Massena, N. Y.
- CARTER, ALFRED ELLSWORTH.....Columbia Univ., New York City.
- CARTER, SHIRLEYNorfolk, Va.
- DEANS, CHARLES HERBERT130 Water St., New York City.
- ELLIOTT, JAMES RUTHERFORD.....Care, Elliott & Baton, 1305 Keystone Bldg., Pittsburg, Pa.
- FOSTER, THOMAS J.....Vice-Pres. and Mgr., National Bridge Supply Co., 116 Nassau St. (Res., 505 West 142d St.), New York City.
- FRINK, FRED GOODRICH1218 Washtenaw Ave., Ann Arbor, Mich.
- GREENE, ROBERT MANSON.....382 Greene Ave., Brooklyn, N. Y.
- GUERINGER, LOUIS AMEDEE.....Asst. Engr., I. & G. N. R. R., Navasota, Tex.
- HALLIHAN, JOHN PHILIP.....Res. Engr. and Supt., Cananea Consolidated Copper Co.'s Ry., La Cananea, Sonora, Mexico.
- HASSKARL, JOSEPH FREDERICK.....2504 North 5th St., Philadelphia, Pa.
- HAUCK, WILLIAM.....742 St. Nicholas Ave., New York City.
- JOHNSON, RANKIN.....Box 21, Ciudad Porfirio Diaz, Coahuila, Mexico.
- LEWERENZ, ALFRED COURTNEY.....Naval Station, New London, Conn.
- MILLER, SHREWSBURY BEAUREGARD..261 Union St., Hackensack, N. J.
- MORRISON, EUGENE TAYLOR.....Supt., Levering & Garrigues Co., Dunderlin, N. J.

ASSOCIATES.

SAPH, AUGUSTUS VALENTINE.....Instr. in Civ. Eng., Univ. of Cal. (Res.,
2034 Durant Ave.), Berkeley, Cal.
TURRILL, SHERMAN MARSH.....Asst. Engr., Allen & Farrington, Municipal
Engrs., 513 Dilleye Memorial Bldg., Syracuse, N. Y.

JUNIORS.

BELZNER, THEODORE.....	Insp. of Steel Constr., Manhattan Valley Viaduct (Section 12), Rapid Transit R. R., 231 West 125th St. (Res., 142 West 67th St.), New York City.
BURWELL, ROBERT LEMMON.....	Shortsville, N. Y.
CLEAVER, PITSON JAY.....	113 Henry St., Brooklyn, N. Y.
FORBES, HENRY DE BRETON.....	Engr., H. E. Talbott & Co., Sault Ste. Marie, Mich.
FORD, WILLIAM HAYDEN	506 Hale Bldg., Philadelphia, Pa.
HARSHEARGER, ELMER DWIGHT.....	Rolla, Mo.
HIGGINSON, JONATHAN YATES.....	216 East 15th St., New York City.
KAST, CLARKE NIGHTINGALE	270 Central Ave., Rochester, N. Y.
KLINE, VICTOR WITMER.....	112 Hallett Pl., Bellevue, Pa.
LANT, FRANK PARSONS.....	66 West 84th St., New York City.
MINOR, EDWARD EASTMAN.....	493 Edgewood Ave., New Haven, Conn.
RHEA, WILLIAM DOUGLAS.....	Manago National Fertilizing Co., Nash- ville, Tenn.
ROCKWELL, JAMES VINCENT	Eagle Grove, Iowa.
RYDER, ELY MORGAN TALCOTT.....	40 Whalley Ave., New Haven, Conn.
WAUGH, WILLIAM HAMMOND.....	Greenville, Pa.
WOOLLARD, GEORGE CLIFTON.....	Hornellsville, N. Y.
YOUNG, HENRY AMERMAN.....	U. S. Engr. Office, Tuscaloosa, Ala.

DEATHS.

CLEVERDON, HENRY LAWRENCE.....Elected Associate Member March 1st, 1899; died August 27th, 1902.
GELETTE, WILLIAM DURFEE.....Elected Member April 1st, 1885; died April 27th, 1902.

RESIGNATION.

REGISTRATION

Date of
Resignation.

GILLIS, HARRY ALEXANDER..... October 10th, 1902

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(September 10th to October 7th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal, Assoc. Eng. Soc.*, 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings, Eng. Club of Phila.*, 1122 Girard St., Philadelphia, Pa.
- (3) *Journal, Franklin Inst.*, Philadelphia, Pa., 50c.
- (4) *Journal, Western Soc. of Eng.*, Monadnock Block, Chicago, Ill.
- (5) *Transactions, Can. Soc. C. E.*, Montreal, Que., Can.
- (6) *School of Mines Quarterly*, Columbia Univ., New York City, 50c.
- (7) *Technology Quarterly*, Mass. Inst. Tech., Boston, Mass., 75c.
- (8) *Stevens Institute Indicator*, Stevens Inst., Hoboken, N. J., 50c.
- (9) *Engineering Magazine*, New York City, 25c.
- (10) *Cassier's Magazine*, New York City, 25c.
- (11) *Engineering* (London), W. H. Wiley, New York City, 35c.
- (12) *The Engineer* (London), International News Co., New York City, 35c.
- (13) *Engineering News*, New York City, 15c.
- (14) *The Engineering Record*, New York City, 12c.
- (15) *Railroad Gazette*, New York City, 10c.
- (16) *Engineering and Mining Journal*, New York City, 15c.
- (17) *Street Railway Journal*, New York City, 35c.
- (18) *Railway and Engineering Review*, Chicago, Ill., 10c.
- (19) *Scientific American Supplement*, New York City, 10c.
- (20) *Iron Age*, New York City, 10c.
- (21) *Railway Engineer*, London, England, 25c.
- (22) *Iron and Coal Trades Review*, London, England, 25c.
- (23) *Bulletin, American Iron and Steel Assoc.*, Philadelphia, Pa.
- (24) *American Gas Light Journal*, New York City, 10c.
- (25) *American Engineer*, New York City, 20c.
- (26) *Electrical Review*, London, England.
- (27) *Electrical World and Engineer*, New York City, 10c.
- (28) *Journal, New England Water-Works Assoc.*, Boston, \$1.
- (29) *Journal, Society of Arts*, London, England, 15c.
- (30) *Annales des Travaux Publics de Belgique*, Brussels, Belgium.
- (31) *Annales de l'Assoc. des Ing. Sortis des École Spéciales de Gand*, Brussels, Belgium.
- (32) *Mémoires et Compte Rendu des Travaux*, Soc. Ing. Civ. de France, Paris, France.
- (33) *Le Génie Civil*, Paris, France.
- (34) *Portefeuille Économique des Machines*, Paris, France.
- (35) *Nouvelles Annales de la Construction*, Paris, France.
- (36) *La Revue Technique*, Paris, France.
- (37) *Revue de Mécanique*, Paris, France.
- (38) *Revue Générale des Chemins de Fer et des Tramways*, Paris, France.
- (39) *Railway Master Mechanic*, Chicago, Ill., 10c.
- (40) *Railway Ave*, Chicago, Ill., 10c.
- (41) *Modern Machinery*, Chicago, Ill., 10c.
- (42) *Translations, Am. Inst. Elec. Engrs.*, New York City, 50c.
- (43) *Annales des Ponts et Chaussées*, Paris, France.
- (44) *Journal, Military Service Institution*, Governor's Island, New York Harbor, 50c.
- (45) *Mines and Minerals*, Scranton, Pa., 20c.
- (46) *Scientific American*, New York City, 25c.
- (47) *Mechanical Engineer*, Manchester, England.
- (48) *Proceedings, Eng. Soc. W. Pa.*, 410 Penn Ave., Pittsburg, Pa., 50c.
- (49) *Transactions, Mining Inst. of Scotland*, London and Newcastle-upon-Tyne.
- (50) *Municipal Engineering*, Indianapolis, Ind., 25c.
- (51) *Proceedings, Western Railway Club*, 225 Dearborn St., Chicago, Ill., 25c.
- (52) *American Manufacturer and Iron World*, 59 Ninth St., Pittsburg, Pa.
- (53) *Minutes of Proceedings, Inst. C. E.*, London, England.
- (54) *Power*, New York City, 20c.
- (55) *Official Proceedings, New York Railroad Club*, Brooklyn, N. Y., 15c.
- (56) *Journal of Gas Lighting*, London, England, 15c.
- (57) *Cement and Engineering News*, Chicago, Ill., 25c.

LIST OF ARTICLES.

Bridge.

The Proper Curvature for a Filled Arch.* Daniel B. Luten. (15) Sept. 12.
 The Eighteen Mile Creek Viaduct.* (14) Sept. 20.
 Unit Stresses and Impact in Old Railway Bridges. A. F. Robinson, M. Am. Soc. C. E., (13) Sept. 25.

New Kew Bridge.* (12) Serial beginning Sept. 26.
 Warped Ends for Concrete Arch Culverts.* Daniel B. Luten. (15) Oct. 3.
 Pont-Bascule de Milwaukee (États-Unis).* (33) Aug. 30.
 Méthode de Calcul Rapide des Voûtes et de leurs Culées. C. Tourtay. (35) Serial beginning Sept.

Electrical.

The Arcophone or Speaking Arc Lamp. G. R. Smith and R. A. L. Snyder. (58) Aug.
 The Use of Electricity in Iron and Steel Works.* F. Kylberg. (Paper read before the Iron and Steel Inst.) (22) Sept. 5.

The Application of Electric Power to the Iron and Steel Industries. D. Selby-Bigge. (Paper read before the Iron and Steel Inst.) (22) Sept. 5.
 The New Electricity Works of the Corporation of Sunderland.* (26) Sept. 5.

Rational Electromagnetic Units. (27) Sept. 6.
 Water Power Transmission for the Springfield, Mass., Lighting System.* (27) Sept. 6.
 The Electrical Driving of Machinery: Its Economy and Advantages. Frank Broadbent, M. I. E. E. (26) Sept. 12.

The Up-Keep of the Direct Current Motor. Alfred H. Mayes. (26) Sept. 12.
 Electric Power Distribution in the Black Country.* (26) Sept. 12.

The Power Equipment of the Westinghouse Works at Trafford Park.* (26) Sept. 12.

Electric Power in a Paper Mill.* (26) Sept. 12.
 Water and Electric Power Plant in North Wales.* (26) Sept. 12.

Three-Phase Power Plant in a Welsh Lead Mine.* (26) Sept. 12.
 The Kalgoorlie Electric Power and Lighting System.* (26) Sept. 12.

Electric Power, Light and Electric Welding Installation at the New Pimlico Wheel-Works.* (26) Sept. 12.

High-Pressure Oil-Brake Switches.* (26) Sept. 12.
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Wireless Telegraphy and Maxwell's Theory. Frederick K. Vreeland. (27) Sept. 13.
 Deterioration of Storage Battery Plates. A. L. Marsh. (27) Sept. 13.

Electric Power in Steam Railway Shops.* (27) Sept. 13.
 The Electric Supply Power Station at Neptune Bank, Newcastle-upon-Tyne.* W. B. Woodhouse. (Paper read before the Inst. of Mech. Engrs.) (47) Sept. 13.

The Largest Electric Water Power Station in New England.* (27) Sept. 20.
 Checking Electrical Instruments.* Clayton H. Sharp. (27) Sept. 20.

Construction of Transmission Lines. (27) Sept. 20.
 The Use of Electricity in Iron and Steel Works.* F. Kylberg. (47) Serial beginning Sept. 20.

Newcastle and District Electric Lighting Company's Power Stations.* W. D. Hunter. (Paper read before the Inst. of Mech. Engrs.) (47) Sept. 20.
 The Polycyclic Distribution of Electricity.* (26) Sept. 26.

Single-Phase Pumping Plant at Hammersmith.* (26) Sept. 26.
 Wireless Telegraphy System of Prof. Braun and Siemens-Halske.* Emile Guarini. (26) Sept. 26.

Electric Power Transmission and Supply in Switzerland.* (12) Serial beginning Sept. 26.

Piscielli Taeggi's Electric Post. William P. Digby. (11) Sept. 26.
 The Sault Ste. Marie Water Power.* Frank C. Perkins. (27) Sept. 27.
 The Belgian-Ougree Blast Furnaces and Steel Works and Modern Electrically-Operated Plant.* Frank C. Perkins. (10) Sept. 27.

The Physical Limits of Electric-Power Transmission. Alton D. Adams. (9) Oct.
 Costs of Electric Power Transmission: A Practical Application of Principles. Alton D. Adams. (10) Oct.

An Interesting Fragment of Electrical History. (13) Oct. 2.
 The Prevention of Electrolysis of Gas and Water Pipes in Great Britain. (13) Oct. 2.
 Apparatus of the Braun-Siemens & Halske System of Wireless Telegraphy.* (27) Oct. 4.

Emploi d'Électricité dans les Forges.* A. Abraham. (33) Aug. 30.
 La Télégraphie sans Fil.* G. Espitalier. (33) Serial beginning Sept. 6.

Marine.
 Steam Trials of H. M. S. *King Alfred*. (11) Sept. 5.
 Some Early Submarine Torpedo Boats.* G. W. Baird. (Reprinted from the *Journal of the Amer. Soc. of Naval Engrs.*) (13) Sept. 11.

The French Battleship *République** (12) Sept. 12.
 On the Strength of High-Speed Vessels. M. J. A. Normand. (11) Sept. 12.

The Steam Yacht *Arrow*—the Fastest Boat in the World.* (46) Sept. 20.
 The *Kaiser Wilhelm II*, the Longest Steamship ever Constructed.* (13) Sept. 25.

The British Fleet, 1889-1902.* Archibald S. Hurd. (10) Oct.
 Résistance des Carrées. Chaigneau. (36) Serial beginning Aug. 25.

Mechanical.
 Rotative Pumping.* John Richards. (1) Aug.
 The Deutz Gas-Motor Works.* (11) Sept. 5.

Mechanical Continued.

- The Compression of Steel by Wire-Drawing during Solidification in the Ingot Mould.* A. Harnet. (Abstract of paper read before the Iron and Steel Inst.) (22) Sept. 5.
 Tests of Steam Turbine Installed at Hartford, Conn. Wm. Lispenard Robb. (27) Sept. 6.
- The Erection and Working of Inclined Retort Settings. E. Merz. (Reprinted from *Journal für Gasbeleuchtung*.) (60) Sept. 9.
- Gas Engines for Central Station Work. Charles H. Williams. (62) Sept. 11.
- Specifications for Foundry Supplies. (13) Sept. 11.
- Shop Tools and Rigs.* James A. Murphy. (47) Sept. 13.
- Proper Charging of Ammonia Compression Plant. (62) Sept. 18.
- Superheat and Superheaters. H. Cruse. (Reprinted from *Engineering Times*.) (62) Sept. 18.
- The Works of Messrs. Belliss and Moreton, Limited.* (11) Sept. 19.
- Recent Progress in Large Gas Engines.* Herbert A. Humphrey, M. I. Mech. E. (Paper read before the British Assoc.) (11) Serial beginning Sept. 19.
- Inclined Retorts at the Vaise (Lyons) Gas-Works.* M. Godinet. (Paper read before the Société Technique du Gaz en France.) (66) Sept. 23.
- Cable-Guided Gasholder at the Rodez Gas-Works.* M. Godinet. (Paper read before the Société Technique du Gaz en France.) (66) Sept. 23.
- Steam Generation for Large Rolling Mills.* J. R. Bibbins. (20) Sept. 25.
- The Smokeless Combustion of Bituminous Fuels. W. H. Booth, M. Am. Soc. C. E. (Abstract of paper before the British Assoc. for the Advancement of Science.) (26) Sept. 26.
- New Types of Cranes.* Waldon Fawcett. (62) Sept. 25.
- The Daw Air-Compressor. (11) Sept. 26.
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- The Power Plant of the Stecher Lithographic Company, Rochester, N. Y.* (14) Sept. 27.
- Power Plant of the Park Row Building.* (64) Oct.
- Triple-Pressure Riveter, with Outside Packing.* (25) Oct.
- The Steam Engine at the Dusseldorf Exposition.* (64) Oct.
- Cast vs. Wrought Iron Steam Mains.* C. G. Robbins. (64) Oct.
- Westinghouse Steam Turbines for the Rapid Transit Subway.* (64) Oct.
- The "Series-Vapor" and "Heat-Waste" Engines, as Supplementary to Single-Vapor Engines. R. H. Thurston. (3) Serial beginning Oct.
- Safe Speeds for Flywheels. Wm. H. Boehm, M. Am. Soc. M. E. (Reprinted from the *Monthly Bulletin of the Fidelity and Casualty Co.*) (13) Oct. 2.
- The Calculation of the Weights of Castings with the Aid of the Planimeter. C. M. Schwerin. (Paper read before the Amer. Inst. of Min. Engrs.) (13) Oct. 2.
- The Suppression of Smoke in Steam Plants Using Bituminous Coal. Albert A. Cary. (20) Serial beginning Oct. 2.
- Improvements at the Schenectady Works of the American Locomotive Co.* (15) Oct. 3.
- The New Power Plant for the Assabet Mills, Maynard, Mass.* (14) Oct. 4.
- The Designing of Steam Power Plants. Walter C. Kerr. (17) Oct. 4.
- Evaluation de la Consommation dans les Moteurs à Gaz. Jules Deschamps. (32) Aug.
- Les Progrès des Moteurs à Gaz: Le Nouveau Moteur Niel. Auguste Moreau. (32) Aug.
- Concours International de Moteurs et Appareils Utilisant l'Alcool Dénaturé. I. Appareils d'Éclairage et de Chauffage par G. Arachequesne; II. Moteurs par G. Coupan. (32) Aug.
- Étude sur les Machines-Outils Utilisées dans le Travail de Bois.* Paul Razous. (37) Aug.
- Les Machines à Jet de Sable.* A. de Riva Berni. (33) Sept. 6.
- Les Machines à Vapeur à l'Exposition de Dusseldorf.* P. Dujardin. (33) Sept. 20.
- Metallurgical.**
- The Progress and Manufacture of Pig Iron in Germany since 1880. W. Brugmann (Paper read before the Iron and Steel Inst.) (11) Serial beginning Sept. 5; (22) Sept. 5.
- Progress in Steel Works Practice in Germany since 1880. R. M. Daelen. (Paper read before the Iron and Steel Inst.) (11) Sept. 5; (22) Sept. 5; (13) Sept. 25.
- The Works of the Skinningrove Iron Company.* (22) Sept. 12.
- The Designing and Equipment of Blast Furnaces.* John L. Stevenson. (12) Serial beginning Sept. 12.
- The Overheating of Mild Steel. E. Heyn. (Paper read before the Iron and Steel Inst.) (11) Serial beginning Sept. 12.
- Electro-galvanizing. C. F. Burgess and Carl Hambuechen. (27) Sept. 13.
- The Recent Development of Tool Steel. Edmund L. French. (13) Sept. 25.
- Aluminum as a Reducing and Heat Producing Agent. H. Hofman. (62) Sept. 25.
- The Elbers Treatment for Fine Iron Ores. (62) Sept. 25.
- Electro-Metallurgical Problems. Alec. A. Beadle, A. I. E. E. (26) Serial beginning Sept. 26.
- The Metallurgy of Titanium. Auguste J. Rossi. (3) Oct.
- Progress in the Metallurgy of Iron and Steel, especially in the Open-Hearth Process since 1889.* Henry M. Howe. (10) Oct.
- The Steel Plant at Monterey, Mexico. William White, Jr. (62) Oct. 2.
- Compressing Steel Ingots by Wire Drawing in the Ingot Mold. (13) Oct. 2.

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Results in a Continuous Ingot Heating Furnace.* (20) Oct. 2.
Metallic Conduction and the Constitution of Alloys. John Alexander Mathews. (27) Oct. 4.

La Métallurgie du Fer et de l'Acier à l'Exposition de Düsseldorf 1902. Alexander Gouvy. (32) July.

L'Aluminothermie et ses Applications. II. Bertin. (32) Aug.
Forges et Acieries d'Anvers.* (36) Sept. 10.

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Ordnance Engineering as a Mechanical Industry.* J. F. Meigs. (9) Oct.

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Mining in Japan: A Description of the Mines and Plants of the Hokkaido Tanko Tetsudo Kaisha.* Fritz J. Frank. (45) Sept.

Pick and Chain Machines: A Comparison of the Two Types from the Standpoint of an Advocate of Pick Machines. L. J. Daff. (45) Sept.

Gold Mining in the Transvaal, South Africa.* John Hays Hammond. (45) Sept.

Mining Explosives: The Effect of Perfect and Imperfect Detonation.* A. W. Warwick. (45) Sept.

Winning Plants for Great Depths. Hans C. Behr. (45) Sept.

The Auchincloss Breaker: A Description and Some of the Novel Methods Employed in Construction, and in Arrangement and Driving of the Machinery.* Geo. L. Carlisle, Jr. (45) Sept.

The Hydraulic Mining Cartridge. (20) Sept. 5.

Steel Lining Mine at "B" Shaft, Pioneer Mine, Minnesota.* (16) Sept. 13.

The Eastern Coal and Coke Company's Washer at Cokedale, Kans.* W. R. Crane. (16) Sept. 20.

The Economic Theory of Shafts and Slopes for Flat Coal Beds. E. Brackett. (16) Serial beginning Sept. 20.

Damping the Air of Coal Mines as a Safeguard against Explosions. James Ashworth. (22) Sept. 26.

Recent Changes in Mining and Milling in the Galena-Joplin Lead and Zinc District.* W. R. Crane. (16) Sept. 27.

Mining at High Altitudes.* T. A. Rickard. (10) Oct.

Mining Industry and Mineral Resources of British Columbia. Wm. M. Brewer. (9) Oct.

The Beaumont Oil Field. Robert T. Hill. (13) Oct. 2.

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An Instructive Study of Specifications. (15) Sept. 12.

The Foundations of the American Iron Industry. Archer Brown. (9) Oct.

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The Relation of the Draughtsman to the Workshop. W. H. Booth. (9) Oct.

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Street Railways and State Highways.* Harold Parker. (1) Aug.

The Relation of Street Railway Tracks to the Paving of City Streets. Henry Manley. (1) Aug.

Relation Between Macadam Roads and Electric Street Railways. Edward P. North, M. Am. Soc. C. E. (Paper read at Third Annual Good Roads Convention.) (14) Sept. 13.

Removal of Snow and Ice in the Borough of Manhattan. W. Boardman Reed. (Paper read before the New York State Street Ry. Assoc.) (17) Sept. 13.

Paving a Country Road with Brick. Sam. Huston. (Paper read before the Ohio Soc. of Civ. Engrs. and Surv.) (13) Sept. 25.

Methods Employed in the Construction and Maintenance of the Massachusetts Pipe Line Gas Co.'s Mains in Boston and Vicinity.* W. W. Cummings, M. Am. Soc. C. E. (13) Oct. 2.

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The Trethewey Automatic Train Pipes Coupling.* (15) Sept. 26.

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- The Proper Handling of Compound Locomotives.* W. J. McCarroll. (Abstract of paper read before the Traveling Engrs. Assoc.) (15) Sept. 26.
- The Tractive Force of Locomotives. Edward L. Coster, A. M. Am. Soc. M. E. (25) Oct.
- Steel Rails: Specifications. Robert Job. (25) Oct..
- The Relation between Heating Surface and Cylinder Power: A Measure for the Steaming Capacity of Locomotives. Lawford H. Fry. (25) Oct.
- Six-Coupled Switching Locomotive, Lake Shore & Michigan Southern Railway.* (25) Oct.
- The Lighting of Railway Trains in Europe.* H. Guérin. (9) Oct.
- New Locomotive and Car Shops, Collinwood, Ohio; Lake Shore & Michigan Southern Railway.* (25) Serial beginning Oct.
- The Third-Rail Electric System on the New York, New Haven & Hartford R. R. (13) Oct. 2.
- The Taylor Electric Interlocking System.* (13) Oct. 2.
- Nouvel Atelier de Montage des Locomotives de la Compagnie des Chemins de Fer de l'Est, à Épernay. M. Desgeans. (38) Sept.

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- The Street Railway System of Providence, Rhode Island, and Vicinity.* George B. Francis. (1) Aug.
- Street Railway Track Construction in City Streets.* Arthur L. Plimpton. (1) Aug.
- The Relation of Street Railway Tracks to the Paving of City Streets. Henry Manley. (1) Aug.
- Track and Overhead System for an Interurban Electric Railway. Gilbert Hodges. (1) Aug.
- Street Railways and State Highways.* Harold Parker. (1) Aug.
- The "Dolter" Surface Contact System.* (26) Sept. 19.
- Cars for the New York Subway.* (17) Sept. 20.
- The Track Construction of Suburban and Interurban Electric Railways. (17) Sept. 20.
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- Cars for the Interborough Rapid Transit Railway, New York City.* (25) Oct.; (18) Sept. 27.
- Detroit Electric Railways.* (27) Oct. 4.
- Flint Division of Detroit United Railway Company.* S. T. Dodd. (27) Oct. 4.
- Telephony in Street Car Dispatching.* (27) Oct. 4.
- Motive Power and Rolling Stock of the Detroit United Railway.* Thomas Farmer. (17) Oct. 4.
- Overhead Construction and Electric Power Distribution of the Detroit United Railway System.* (17) Oct. 4.
- Train Dispatching on Interurban Railways Around Detroit.* (17) Oct. 4.
- Motive Power and Rolling Stock on the Rapid Railway.* (17) Oct. 4.
- The Operation of Electric Interurban Railways.* W. O. Wood. (17) Oct. 4.
- Power Distribution and Operating Points on the Detroit, Ypsilanti, Ann Arbor & Jackson Railway.* (17) Oct. 4.
- Interurban Electric Railway Car Equipment. W. B. Potter. (17) Oct. 4.
- Trucks for Interurban Service.* C. F. Uebelacker. (17) Oct. 4.
- Tests of Interurban Cars of Union Traction Company.* Clarence Renshaw. (17) Oct. 4.
- Suburban Traffic Conditions of London, England.* Philip Dawson. (17) Oct. 4.
- Cars for High-Speed Interurban Service.* (17) Oct. 4.
- The Boston and Worcester Street Railway.* (17) Oct. 4.
- The Oley Valley Railway.* (17) Oct. 4.
- The Aurora, Elgin and Chicago Railway.* (17) Oct. 4.
- Application de la Traction Électrique au Chemin de Fer Métropolitain de New York (Manhattan Railway).* Henry Martin. (33) Serial beginning Sept. 13.

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- Problems in Maintenance of Purity, Equability and Moisture of Air in Dwellings. P. H. Bryce. (67) Sept.
- Engineer's Report on the Garbage Furnaces of Trenton, N. J. Rudolph Hering. (13) Sept. 11; (14) Sept. 13.
- Ventilating and Heating School No. 23, Rochester, N. Y.* (14) Sept. 20.
- A Dozen Years' Experience in Sewage Purification at Santa Rosa, Cal. (13) Oct. 2.
- Plumbing in the Flat-Iron Building, New York.* (14) Oct. 4.
- Sewage Disposal Works at Nuneaton, England. (14) Oct. 4.
- Épuration des Eaux d'Égout. G. Richou. (33) Sept. 13.

Structural.

- Standard Portland Cement Tests. (Report of Special Committee Submitted to Canadian Soc. of Civ. Engrs.) (67) Sept.
- The Bank of the State of New York.* (14) Sept. 13.
- The Steel Framework of the Farmers' Bank Building, Pittsburgh, Pa.* (13) Sept. 18.
- Deterioration of Steel from Vibration. (12) Sept. 19.

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- The Paradox of the Pantheon.* (14) Sept. 20.
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 Discussion of Standard Specifications for Steel Forgings and Castings. Gus C. Henning. (Before Amer. Inst. of Min. Engrs.) (62) Oct. 2.
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 The Philadelphia Company's Building, Pittsburg.* (14) Oct. 4.
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 Formules pour les Parois et Hauteur Economique des Poutres Droites. Ferdinand Hofer. (36) Serial beginning Aug. 25.

Topographical.

- Rapid Base Line Measurement for the Ninety-Eighth Meridian Triangulation.* (14) Sept. 27.

Water Supply.

- Rotative Pumping.* John Richards. (1) Aug.
 Water Power Transmission for the Springfield, Mass., Lighting System.* (27) Sept. 6.
 Sand Washers for the Slow Sand Filters of Mt. Vernon, N. Y.* (13) Sept. 11.
 The San Leandro Earth Dam of the Oakland Water-Works (125 ft. high).* Burr Bassell. (13) Sept. 11.
 The New Power Plant at Sault Ste. Marie.* (18) Sept. 13.
 Notes on the History of Turbine Development in America. A. C. Rice. M. Am. Soc. C. E. (13) Sept. 18.
 Fair, Just and Reasonable Water Rates. (14) Sept. 20.
 Notes on Irrigation Engineering. (14) Sept. 20.
 The Nile Irrigation Works.* (46) Sept. 20.
 The Largest Electric Water Power Station in New England.* (27) Sept. 20.
 The Water-Power Plant of the Michigan-Lake Superior Power Co., at Sault Ste. Marie.* (13) Sept. 25.
 Report on Water-Works Rates and Valuation at San Antonio, Tex. (13) Sept. 25.
 An Engineering Commission on the Artesian Wells of the Memphis Water-Works. (13) Sept. 25.
 Electric Power Transmission and Supply in Switzerland.* (12) Serial beginning Sept. 26.
 Single-Phase Pumping Plant at Hammersmith.* (26) Sept. 26.
 A List of Failures of American Dams. W. R. Hill, M. Am. Soc. C. E. (From Presidential Address before the Amer. W. W. Assoc.) (14) Sept. 27.
 The Sault Ste. Marie Water Power.* Frank C. Perkins. (27) Sept. 27.
 The Prevention of Electrolysis of Gas and Water Pipes in Great Britain. (13) Oct. 2.
 Laying Pipe under Water and Submerged Suction Mains. A. L. Hobnes. (Abstract of paper read before the Central States W. W. Assoc.) (13) Oct. 2; (14) Oct. 4.
 A Concrete Power Dam at Middle Falls, N. Y.* (14) Oct. 4.
 Nouvelle Disposition pour Usines-Barrages.* Michel Berthier. (33) Sept. 6.

Waterways.

- The Materials for the Concrete of the Buffalo Breakwater.* Emile Low. M. Am. Soc. C. E. (13) Sept. 11.
 Reconstruction of the Lake Winnibigoshish Dam.* (14) Sept. 18.
 The Oneida Route for a Barge Canal vs. The Seneca-Oneida-Mohawk Route. T. W. Symons. (13) Oct. 2.

* Illustrated.



PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
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(INSTITUTED 1852.)

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NOVEMBER, 1902.

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NEW YORK 1902.

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The House of the Society is open from 9 A.M. to 10 P.M., every day, except Sundays Fourth of July, Thanksgiving Day and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK.

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AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced
in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

November 5th, 1902.—The meeting was called to order at 8.40 p. m., Rudolph Hering, M. Am. Soc. C. E., in the chair; Charles Warren Hunt, Secretary; and present, also, 98 members and 18 visitors.

The minutes of the meetings of October 1st and 15th, 1902, were approved as printed in *Proceedings* for October, 1902.

A paper entitled "The Footbridge for Building the Cables of The New East River Bridge," was presented by the author, Isaac Harby, Jun. Am. Soc. C. E., and illustrated with lantern slides. The subject was discussed by Wilhelm Hildenbrand, M. Am. Soc. C. E.

Ballots for membership were canvassed, and the following candidates were elected:

AS MEMBER.

ULYSES B HOUGH, Kellogg, Idaho.

AS ASSOCIATE MEMBERS.

HERBERT JAMES CHAMBERS, New York City.

FRED RUFUS DAVIS, Juneau, Pa.

LEONARD HENRY DAVIS, Sault Ste. Marie, Ont., Canada.

ALVAH BENJAMIN DIEHR, Memphis, Tenn.

WILLIAM HALE HAM, New York City.

WINFRED DEAN HUBBARD, Concord, Mass.

JOEL JUK PEMOFF, New York City.

JOSEPH JEANES WALKER, New York City.

The Secretary announced the election of the following candidates by the Board of Direction on November 4th, 1902:

AS JUNIORS.

GEORGE JACOB DAVIS, Jr., Washington, D. C.

EDUARDO ORTIZ, Mexico City, Mexico.

GEORGE THEOPHANES PARASCHOS, Constantinople, Turkey.

EDMUND MOORE RHETT, Washington, D. C.

FRANK MAURICE WEAVER, Philadelphia, Pa.

The Secretary announced the death of GEORGE HENRY MENDELL, elected Member September 6th, 1876; died October 19th, 1902.

Adjourned.

November 19th, 1902.--The meeting was called to order at 8.40 p. m., Emil Kuichling, Director, Am. Soc. C. E., in the chair; Chas. Warren Hunt, Secretary; and present, also, 112 members and 11 guests.

A paper, entitled, "An Alternative Line for the Nicaragua Canal, and a Proposed New Method of Dam Construction," by J. Francis Le Baron, M. Am. Soc. C. E., was presented by the Secretary, who also read a communication on the subject from L. M. Haupt, M. Am. Soc. C. E., and exhibited a set of lantern slides, illustrative of the Nicaragua Canal, sent by H. de B. Parsons, M. Am. Soc. C. E.

The subject was discussed by Messrs. Alfred Noble, P. C. Hains, Edward P. North and Edward Wegmann.

The Secretary announced the death of JOHN WOODBRIDGE DAVIS, elected Associate June 3d, 1885; died November 7th, 1902.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

November 4th, 1902.—Vice-President Haines in the Chair; Charles Warren Hunt, Secretary; and present, also, Messrs. Briggs, Croes, Jackson, Knap, Kuehling, Pegram, Seaman and Swain.

The Secretary was instructed to prepare and publish an additional Catalogue of the Library of this Society, covering additions to the Library since the first Catalogue was issued, about $2\frac{1}{2}$ years ago.

On the invitation of the Managers and Faculty of Swarthmore College, Henry B. Seaman, M. Am. Soc. C. E., was appointed to represent this Society at the inauguration of Joseph Swain, LL.D., as President of Swarthmore College, on November 15th, 1902.

The Secretary reported the receipt, through the executor of Herbert Steward, deceased, of \$1,940, to be known as the Herbert Steward Library Fund. The income of this fund is to be used annually for the purchase of books, etc., for the Library.

The appointment of a Committee was authorized to take up the question of an exhibit, in the name of the Society, at the World's Fair, St. Louis, 1904; and also to take such action as may be deemed necessary in interesting members of the Society in general in an engineering exhibit.

Applications were considered and other routine business transacted.

Five candidates for Junior were elected.

Adjourned.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, December 3d, 1902.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and a paper by A. C. Dennis, M. Am. Soc. C. E., entitled "Virtual Grades for Freight Trains," will be presented for discussion.

This paper is printed in this number of *Proceedings*.

Wednesday, December 17th, 1902.—8.30 p. m.—At this meeting there will be an informal discussion on the topic, "The Sanitary Disposal of Municipal Refuse." The discussion will be opened by Rudolph Hering, M. Am. Soc. C. E. Contributions to this discussion, either at the meeting or in writing, are invited.

ANNUAL MEETING.

The Fiftieth Annual Meeting will be held at the Society House, January 21st and 22d, 1903. The Business Meeting will be called to order at 10 o'clock on Wednesday morning. The annual reports will be read, officers for the ensuing year elected, members of the Nominating Committee appointed, and other business transacted.

The arrangements for excursions and entertainments will be announced later.

NOMINATING COMMITTEE.

The Constitution provides that at the Annual Meeting of each year, seven Corporate Members, not officers of the Society, one from each of the geographical districts, into which the Society is divided for this purpose, shall be appointed by the meeting to serve for two years.

The usual blank request for suggestions as to representatives of each district, for presentation to the meeting, will soon be mailed to Corporate Members.

ACCESSIONS TO THE LIBRARY.

From October 8th to November 11th, 1902.

DONATIONS.*

THE DESIGN OF SIMPLE ROOF-TRUSSES IN WOOD AND STEEL.

With an Introduction to the Elements of Graphic Statics. By Malverd A. Howe, M. Am. Soc. C. E. Cloth, 9 x 6 ins., 8 + 129 pp., illus. New York, John Wiley & Sons, 1902. \$2.00.

The author states that the object in writing this work has been to bring together in small compass all the essentials required in properly designing ordinary roof trusses in wood and steel. The tables giving the properties of standard shapes are based upon sections rolled by the Cambria Steel Company. The chapter headings are: General Principles and Methods; Beams and Trusses; Strength of Materials; Roof-Trusses and their Design; Design of a Wooden Roof-Truss; Design of a Steel Roof-Truss; Tables. There is an index of five pages.

THEORY OF STEEL-CONCRETE ARCHES, AND OF VAULTED STRUCTURES.

By William Cain, M. Am. Soc. C. E. Second Edition, Thoroughly Revised. Cloth, 6 x 4 ins., 86 pp., illus. New York, D. Van Nostrand Company, 1902. 50 cents. (Donated by the Author.)

The preface states that, in this revision, the author has availed himself of the opportunity to give a complete solution of the elastic arch of variable section. The arch of steel and concrete combined is taken up in detail to illustrate the general graphical treatment. The method to follow for other arches, as those of steel, stone or concrete, is at once apparent from the general solution. The aim throughout has been to give a clear analysis of principles involved, a knowledge of the principles of the equilibrium polygon being alone assumed. This book, although independent of the author's other works on Arches, really supplements them, since in "Theory of Voussoir Arches," the elastic arch of constant section is alone treated, and in "Theory of Solid and Braced Elastic Arches," the arch of variable section is very briefly considered without a completely worked out example. This work then deals especially with the most complicated case, and it is believed that a thoroughly practical solution is offered. The chapter headings are: Arches of Variable Section under Vertical Loads; Culverts and Tunnel Arches; Groined and Cloistered Arches; Domes of Masonry.

THE ELECTRICAL CATECHISM.

533 Plain Answers to 533 Practical Questions about Electrical Apparatus. Compiled from the Regular Issues of *Power*. Cloth, 9 x 6 ins., 210 pp., illus. New York, Hill Publishing Company, 1902. \$2.00.

In preparing the subject matter of this book the author's aim has been to discuss only such branches of electrical work as may be considered to come within the range of the average central station or isolated plant engineer. On this account he has not endeavored to cover the entire electrical field, but rather to make the treatment of principles and practice in what might be termed the "heavier" branches of electrical engineering more exhaustive than is usual in a work of this kind. No originality is claimed for the subject matter, but an effort has been made to present the expository matter in logical sequence and in clear, every-day phraseology. Parts of the matter here presented have appeared in serial form in *Power*; such portions have been revised to bring them up to date wherever necessary. There is an index of six pages.

ARMATURE WINDINGS OF DIRECT CURRENT DYNAMOS.

Extension and Application of a General Winding Rule. By E. Arnold. Translated from the Original German by Francis B. De Gress. Cloth, 9 x 6 ins., 6 + 124 pp., illus. New York, D. Van Nostrand Company, 1902. \$2.00.

The translator states in his preface that Professor Arnold's "Ankerwicklungen," in which is given his general formula for the design of direct current armature windings, has been considered of sufficient importance to be translated and published in the

* Unless otherwise specified, books in the list have been donated to the Library by the Publisher.

present form. Many of the designs shown by him are of historic interest only, but the principle expressed is fundamental, and of value to the engineer or designer, and no attempt has been made to go beyond the subject as treated in his book. The Contents are: Methods of Connecting Inductors; Closed-Coil Windings; Ring Armature Windings; Drum Windings; Disk Armature Windings; Open-Coil Windings.

ELECTRICAL AND MAGNETIC CALCULATIONS.

For the Use of Electrical Engineers and Artisans, Teachers, Students, and all others interested in the Theory and Application of Electricity and Magnetism. By A. A. Atkinson. Cloth, 7 x 5 ins., 7 + 310 pp., illus. New York, D. Van Nostrand Company, 1902. \$1.50.

It is stated in the preface that this work, both in plan and material, is the outgrowth of several years of experience in teaching young men the rudiments of electricity. A large part of the matter was prepared expressly as an introduction to a course in electrical engineering; since there was nothing published covering the topics found desirable, and making use of the method herein used. In this volume several processes are brought together wherever possible under a single broad principle, which is then expressed by means of a formula. Through a step-by-step process, principles and formulas are evolved from facts and principles already understood. After the law has been clearly developed, and has been given the most concise, easily remembered and convenient working form, the method of induction gives way to that of deduction. A series of examples is then worked out illustrating the application of the principle, and giving familiarity with its processes. At the end of the chapters are also lists of original problems for drill in the mastery of the principles and their applications. The chapter headings are: Explanation of Units; Relation of Quantities; General Laws of Resistance; Electrical Energy; Alternating Currents; Wiring for Light and Power; Batteries; Magnetism; Relation of Magnetic Quantities; The E. M. F. of Dynamos and Motors; Calculation of Fields; Elements of Dynamo Design. There is an index of ten pages.

ALTERNATING-CURRENT MACHINES:

Being the Second Volume of Dynamo Electric Machinery; its Construction, Design, and Operation. By Samuel Sheldon, M. Am. Inst. E. E., and Hobart Mason, Assoc. Am. Inst. E. E. Cloth, 8 x 5 ins., 4 + 259 pp., illus. New York, D. Van Nostrand Company, 1902. \$2.50.

The preface states that this book, like its companion volume on Direct Current Machines, is primarily intended as a text book for use in technical educational institutions. It is hoped and believed that it will also be of use to those electrical, civil, mechanical, and hydraulic engineers who are not perfectly familiar with the subject of Alternating Currents, but whose work leads them into this field. It is furthermore intended for use by those who are earnestly studying the subject by themselves, and who have previously acquired some proficiency in mathematics. It is believed that one who has mastered the first four chapters of this book will be able to solve any practical problem concerning the relations which exist between power, electro-motive forces, currents, and their phases in series or multiple alternating-current circuits containing resistance, capacity, and inductance. The next four chapters are devoted to the construction, principle of operation, and behavior of the various types of alternating-current machines. Only American machines have been considered. A large amount of alternating-current apparatus is used in connection with plants for the long-distance transmission of power. This subject is treated in the ninth chapter. The last chapter gives directions for making a variety of tests on alternating-current circuits and apparatus. There is an index of seven pages.

ELECTRICAL MOTOR INSTALLATIONS.

A Book for Factory Owners and Other Users of Steam Power. By F. J. A. Matthews, A. M. I. E. E. Boards, 8 $\frac{1}{2}$ x 5 $\frac{1}{2}$ ins., 157 pp., illus. The Scientific Publishing Co., Manchester. 2 shillings, 6 pence net.

The preface states that this small book is not intended in any way for the electrical engineer, but is essentially written for users of power who may be desirous of increasing the efficiency of their works. The definitions are given in the plainest manner and in a way in which they can be easily grasped. They may not be in all cases scientifically and absolutely correct, but they are what may be termed commercially correct. The contents are: Introductory; Advantages of Electric Transmission; Definitions and Functions; Typical Types of English Motors; Starting Switches and Other Accessories; Devices for Speed Variation; Some Examples of Motor Installations; Attention and Maintenance. There is an index of three pages.

MECHANICS—PROBLEMS FOR ENGINEERING STUDENTS.

By Frank B. Sanborn. Cloth, 8 x 6 ins., 155 pp., illus. New York, The Engineering News Publishing Company, 1901. \$1.50.

The preface states that this book contains many problems similar to those found in text-books; but, besides, many have been developed from actual engineering conditions. The author's object has been to correlate more closely these every-day practical examples with the important subjects in Mechanics. From the author's experience as student, engineer in practice, and college instructor, he is convinced that the main object of a course in Mechanics should be to prepare the students to solve its problems. Therefore he has endeavored to make these problems—five hundred in number—fulfil the requirements for thorough and interesting instruction. At the beginning of each important section of the book one problem is solved so as to explain the method of solving similar problems and to serve as a guide for solutions to be put in note-books. The problems have been arranged under the following heads: I. Work—Foot Pounds; Horse-Power; Energy; II. Force—Forces Acting at a Point; Moments for Parallel Forces; Couples; Stresses; Center of Gravity; Friction; III. Motion—Uniform Acceleration; Relative Velocity; Distance, Velocity, Friction, Angle of Inclination; Projectiles; Pendulums; Impact. There is an index of fifteen pages.

AN OUTLINE OF THE METALLURGY OF IRON AND STEEL.

By A. Humboldt Sexton. Cloth, 9 x 6 ins., 6 + 620 + 13 pp., illus. The Scientific Publishing Company, Manchester, 1902. 16 shillings net.

The preface states that this work has been prepared to meet the need for a book which, in one volume of moderate size, covers the whole field of the metallurgy of iron and steel. The book has grown somewhat beyond the size contemplated at the outset, but still cannot be regarded as being more than an outline. The iron and steel industry has developed so rapidly within the last few years, and the literature has become so voluminous, that it has been a matter of extreme difficulty to decide exactly what to include and what to leave out. A greater difficulty has been the apportioning of space to the different branches of the subject according to the importance of each, but the author states that he hopes he has kept somewhat near a fair division. The chapter headings are: Introductory; Sources of Iron; Pig Iron; Preparation of Materials for the Smelter; Chemistry of the Blast Furnace; Thermal Phenomena of the Blast Furnace; The Blast Furnace; The Air Supply; The Hot Blast; Blast Furnace Slag; Calculating Charges; Construction of the Blast Furnace; Blast Furnace Practice; Utilization of By-products; History of Pig Iron; The Foundry; Malleable Iron; Puddling; Other Methods of Preparing Malleable Iron; The Forge and the Mill; Steel; Production of Steel Direct from the Ore and from Malleable Iron; Production of Steel by Partial Decarburization of Pig Iron; The Bessemer Process; Chemistry of the Bessemer Process; Thermal Phenomena of the Bessemer Blow; Working the Bessemer Process; Bessemer Plant; The Basic Bessemer Process; Plant for the Basic Bessemer Process; Modifications of the Bessemer Process; Historical Notes on the Bessemer Process; The Siemens or Open-hearth Process; The Siemens Process; Plant; The Basic Open-hearth Process; Modifications of the Open-hearth Process; Appliances Applicable to All Processes; Working Mild Steel; Casting Mild Steel; After Treatment of Iron and Steel; Special Steels; Structure of Iron and Steel; Testing Iron and Steel; Rusting and Protection of Iron and Steel.

AMERICAN MINING CODE:

Embracing the United States, State, and Territorial Mining Laws, and the General Land Office Regulations. Fourteenth Edition. By Henry N. Copp. Paper, 9 x 6 ins., 4 + 183 pp. Washington, D. C., Copp & Co., 1902. 50 cents.

This work gives the mining laws and general land office regulations of the United States, and also the State and Territorial mining laws, and the revised and amended mining regulations for Canada and the Northwest Territories. Copies of the necessary forms, notices, affidavits, certificates, bonds, agreements, etc., are also given.

DES INGENIEURS TASCHENBUCH.

Herausgegeben vom Akademischen Verein "Hütte." Achtzehnte, Neu Bearbeitete Auflage. 2 vol. Leather, 7 x 5 ins., illus. Berlin, Wilhelm Ernst & Sohn, 1902. 16 marks.

It is stated in the preface that the present edition has been enlarged and revised on a scientific basis. Corresponding to the extended knowledge of science in all branches of technology, the separate sections of the book have become more inclusive. Particularly to be noted is the section "Wärme einschliesslich der Mechanik der Gase und

Dämpfe," which has been completely revised; also Turbinen, Lasthebemaschine, Vermessungskunde, Schiffbau. The sections "Verbrennungsmotoren" have been introduced in place of the former "Gasmaschinen," which represented the first attempt at a theoretical handling of this difficult subject. The Contents are: Mathematik; Mechanik; Wärme einschließlich der Mechanik der Gase und Dämpfe; Festigkeitslehre; Stoffkunde; Maschinenteile; Kraftmaschinen; Arbeitsmaschinen; Vermessungskunde; Hochbau; Wasserversorgung; Städteentwässerung; Lüftung und Heizung; Straßenbau; Statik der Baukonstruktionen; Brückenbau; Schiffbau; Eisenbahnenwesen; Eisenhüttenkunde; Electrotechnik; Gasfabrikation; Anhang. There is an index of fifteen pages.

THE FOUNDATIONS OF GEOMETRY.

By David Hilbert. Authorized Translation by E. J. Townsend. Cloth, 8 x 5½ ins., 7 + 132 pp. Chicago, The Open Court Publishing Company, 1902. \$1.00 net.

The preface states that the material contained in this translation was given in substance by Professor Hilbert as a course of lectures on Euclidean geometry at the University of Göttingen during the winter semester of 1898-99. As a basis for the analysis of our intuition of space, Professor Hilbert commences his discussion by considering three systems of things which he calls points, straight lines, and planes, and sets up a system of axioms connecting these elements in their mutual relations. The purpose of his investigations is to discuss systematically the relations of these axioms to one another and also the bearing of each upon the logical development of Euclidean geometry. This development and discussion of the foundation principles of geometry is not only of mathematical but of pedagogical importance. The Contents are: The Five Groups of Axioms; The Compatibility and Mutual Independence of the Axioms; The Theory of Proportion; The Theory of Plane Areas; Desargue's Theorem; Pascal's Theorem; Geometrical Constructions Based upon the Axioms I-V.

ON THE STUDY AND DIFFICULTIES OF MATHEMATICS.

By Augustus De Morgan. Second Reprint Edition. Cloth, 8 x 5½ ins., 6 + 288 pp., por. Chicago, The Open Court Publishing Company, 1902. \$1.25 net.

It is stated in the preface of the original edition that in compiling the pages of this book, the author's object has been to notice particularly several points in the principles of algebra and geometry which have not obtained their due importance in elementary works on these sciences. The author does not hold himself responsible for the contents of this treatise, further than for the manner in which they are presented, as most of the opinions here maintained have been found in the writings of eminent mathematicians. The editor of the present edition states that the original treatise, which was published by the Society for the Diffusion of Useful Knowledge and bears the date 1831, is now practically inaccessible, and is marred by numerous errata and typographical solecisms, from which, it is hoped, the present edition is free. References to the mathematical textbooks now out of print have either been omitted or supplemented by the mention of more modern works. The few notes which have been added are mainly bibliographical in character, and refer, for instance, to modern treatises on logic, algebra, the philosophy of mathematics and pangeometry. The Contents are: Introductory Remarks on the Nature and Objects of Mathematics; On Arithmetical Notation; Elementary Rules of Arithmetic; Arithmetical Fractions; Decimal Fractions; Algebraical Notation and Principles; Elementary Rules of Algebra; Equations of the First Degree; On the Negative Sign, etc.; Equations of the Second Degree; On Roots in General, and Logarithms; On the Study of Algebra; On the Definitions of Geometry; On Geometrical Reasoning; On Axioms; On Proportion; Application of Algebra to the Measurement of Lines, Angles, Proportion of Figures, and Surfaces. There is an index of four pages.

ESSAYS ON THE THEORY OF NUMBERS.

I. Continuity and Irrational Numbers. II. The Nature and Meaning of Numbers. By Richard Dedekind. Authorized translation by Wooster Woodruff Beman. Cloth, 8 x 5½ ins., 115 pp. Chicago, The Open Court Publishing Company, 1901. 75 cents net.

In this work the author has endeavored to establish a really scientific foundation for arithmetic, in order to find a purely arithmetic and perfectly rigorous basis for the principles of infinitesimal analysis. The chapter headings are: Properties of Rational Numbers; Comparison of the Rational Numbers with the Points of a Straight Line; Continuity of the Straight Line; Creation of Irrational Numbers; Continuity of the Domain of Real Numbers; Operations with Real Numbers; Infinitesimal Analysis; Systems of Elements; Transformation of a System; Similarity of a Transformation; Similar Systems; Transformation of a System in Itself; The Finite and the Infinite; Simply Infinite Systems; Series of Natural Numbers; Greater or Less Numbers; Finite and Infinite Parts of the Number-Series; Definition of a Transformation of the Number-Series by Induction; The Class of Simply Infinite Systems; Addition of Numbers; Multiplication of Numbers; Involution of Numbers; Number of the Elements of a Finite System.

CITY ROADS AND PAVEMENTS SUITED TO CITIES OF MODERATE SIZE.

By William Pierson Judson, M. Am. Soc. C. E., M. Inst. C. E. Second Edition, Revised and Enlarged. Cloth, 9 x 6 ins., 195 pp., illus. New York, The Engineering News Publishing Co., 1902. (Donated by the author.) \$2.00.

The local features of the first edition, having served their purpose, have been omitted in this edition, and modifications have been made to show the present applications of general methods, some of which have changed since 1894. The most marked change during the past eight years has been in the increased use of crushed stone for roadways of macadam and of telford construction, on the improved streets of villages and cities. The grade of a city street being usually a fixed condition and not a theory, it is often difficult to decide as to the best pavement for a fixed steep grade in a given climate, or how steep a grade will give good results with a given pavement. Tables of actual instances are given, in order that engineers may know where to find conditions similar to their own, and where they may examine certain pavements in actual use. The Contents are: Preparation of Streets for Pavements; Ancient Pavements; Modern Pavements; Concrete Base for Pavement; Block-Stone Pavements; Wood Pavements; Vitrified Brick Pavements; American Sheet-Asphalt, Artificial and Natural; Bituminous Macadam Pavement; Broken Stone Roads. There is an index of nine pages.

TABLES FOR OBTAINING HORIZONTAL DISTANCES

And Difference of Level from Stadia Readings. Computed by Alfred Noble and Wm. T. Casgrain. Cloth, 7 x 5 ins., 7 pp., 19 tables. New York, The Engineering News Publishing Co., 1902. \$1.00.

The introduction describes the stadia rod, and the method to be used in graduating it, and gives the formulas for horizontal distances and differences of level from which the tables in the book have been calculated. The values for angles of elevation or depression up to 20° are given, and may be taken from the tables in a manner similar to that used in taking latitudes and departures from a traverse table.

TOPOGRAPHICAL RECORD AND SKETCH BOOK.

For Use with Transit and Stadia. By Daniel Lawrence Turner, Assoc. M. Am. Soc. C. E. Cloth, 7½ x 5 ins. New York, The Engineering News Publishing Company, 1902. 75 cents.

The introduction states that this record and sketch book is the outcome of efforts in teaching students topographical surveying. A sketch book with concentric circles and radial rulings was first tried by the author in 1896. The results proved to be so satisfactory that in 1898 a book containing such rulings was printed for students in the author's classes, where it has since been used with gratifying results. Believing that such book may also be appreciated by fellow teachers and by engineers and surveyors generally, it is now placed at their disposal. The method of using the book is almost self-evident. The vertical rulings are of such form that they may be readily adapted to almost any method of recording. They are suitable for level notes, and also for the ordinary land survey and traverse records. The right-hand page can be used for any kind of sketching. As soon as the re-order has noted down the observed azimuth, distance, and vertical angle on the left-hand page, he proceeds to plot the corresponding point approximately in its true position on the sketch page, each point being designated by its number. As fast as the controlling points are plotted the sketch is drawn in. It is not necessary to reduce the elevations in the field, the sketch as drawn need only indicate the configuration. The book contains 75 pages ruled for notes and sketching, and there is a table for the reduction of stadia notes.

STAND-PIPE ACCIDENTS AND FAILURES IN THE UNITED STATES.

A Chronological Record of Accidents to and Failures of Water-Works Stand-Pipes in the United States, with Full Discussion and Assignment of Theories. Also a discussion of Current Practice in Specifications for Stand-Pipes and of other Related Matters. By Wm. D. Pence. Paper, 7 x 4 ins., 7 + 195 pp., illus. New York, Engineering News Publishing Co., 1895. \$1.00.

The author states in the preface that, as originally contemplated, the record was to consist simply of a compilation of facts and data relating to the various cases described, but it early became evident that the investigation would lack a very important feature should no attempt be made to digest the compiled facts for the purpose of formulating a definite theory for each accident or failure included in the record. Therefore, an effort has been made to meet this requirement by giving close consideration to all

available information bearing upon the conditions and circumstances attending or leading up to the several accidents. A list of references to sources of information is given at the conclusion of each description. With the exception of a few additions and revisions, the original record comprising the body of the book is a reprint of a series of articles which appeared first in *Engineering News* during the months of April, May and June, 1894.

Gifts have also been received from the following:

- Am. Ceramic Soc. 1 vol.
- Am. Electrochemical Soc. 1 bound vol., 1 pam.
- Am. Inst. of Min. Engrs. 1 bound vol.
- Ark.—R. R. Comm. 1 bound vol.
- Assoc. des Ingén. Sortis des Ecoles Spéciales de Gand. 1 pam.
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- New York City—Dept. of Bridges. 1 pam.
- N. Y. State Lib. 1 pam.
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- North, Edward P. 1 vol., 4 pam., 1 map.
- North-East Coast Inst. of Engrs. and Ship-builders. 1 bound vol.
- Northern Pacific Ry. Co. 2 pam.
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- Purdon, C. D. 1 pam.
- Reading Pa.—Water Dept. 7 bound vol., 1 pam.
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- Safford, Arthur Truman. 1 bound vol.
- Schneider, C. C. 15 blue-prints.
- Smith, T. Guilford. 1 vol.
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- Tillson, Geo. W. 1 vol.
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- Tucson, Ariz.—Chamber of Commerce. 1 pam.
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- U. S. Civil Service Comm. 1 bound vol.
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- U. S. Geol. Surv. 1 bound vol., 4 vol., 4 pam.
- U. S. Naval Observatory. 1 pam.
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- Univ. of Wis. 2 vol.
- Webster, George S. 1 bound vol., 1 vol.
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- Wilgus, W. J. 1 bound vol.
- Winchester, Mass.—Water Board. 13 pam.
- Woonsocket, R. I.—Board of Water Comms. 1 pam.

BY PURCHASE.

Die Elektricitäts Generatoren auf der Pariser Weltausstellung in 1900. Von C. F. Guibert. Paris, C. Naud, 1902.

Die Funkentelegraphie. Gemeinverständliche Vorträge von A. Slaby. Zweite Auflage. Berlin, Leonhard Simion, 1901.

The Electric Arc. By Hertha Ayrton, M. Inst. E. E. New York, The D. Van Nostrand Company; London, "The Electrician" Printing and Publishing Company, Limited, 1902.

Die Eis- und Kälteerzeugungs-Maschinen. Ihr Bau und ihre Verwendung in der Praxis. Ein Compendium der gesamten Kälte-Industrie. Von Richard Stetefeld. Stuttgart, Max Waag, 1901.

Practical Metallurgy and Assaying; a Text-Book for the Use of Teachers, Students and Assayers. By Arthur Hiorns. London, Macmillan and Co., Limited; New York, The Macmillan Company, 1902.

The Mineral Industry, Its Statistics, Technology, and Trade in the United States and Other Countries to the End of 1901. Founded by the Late Richard P. Rothwell. Edited by Joseph Struthers. Vol X. New York and London, The Engineering and Mining Journal, 1902.

The Prospector's Handbook. A Guide for the Prospector and Traveller in Search of Metal-Bearing or Other Valuable Minerals. By J. W. Anderson, F. R. G. S., F. I. Inst. Ninth Edition. London, Crosby Lockwood and Son; D. Van Nostrand Company, New York, 1902.

The Arithmetic of Electrical Measurements, with Numerous Examples, Fully Worked. By W. R. P. Hobbs, Assoc. Inst. E. E. Revised to Date by Dr. Richard Wormell. Tenth Edition. London, Thomas Murby; New York, D. Van Nostrand Company, 1902.

Report of the Tests of Metals and Other Materials for Industrial Purposes Made with the United States Testing Machine at Watertown Arsenal, Massachusetts, during the Fiscal Year Ended June 30, 1899. Washington, Government Printing Office, 1900.

Water and Its Purification; a Handbook for the Use of Local Authorities, Sanitary Officers, and Others Interested in Water Supply. By Samuel Rideal. Second Edition, Revised and Extended. London, Crosby Lockwood and Son; Philadelphia, J. B. Lippincott Company, 1902.

The Sea-Coast. By W. H. Wheeler, M. Inst. C. E. Longmans, Green and Co., London, New York and Bombay, 1902.

SUMMARY OF ACCESSIONS.

From October 8th to November 11th, 1902.

Donations (including 22 duplicates).....	361
By Purchase.....	11
Total	372

MEMBERSHIP.**ADDITIONS.****MEMBERS.**

		Date of Membership.
BELL, GEORGE JOSEPH		
County Surv. and Bridge Master for Cumber-	{ Assoc. M.	Nov. 1, 1898
land, 16 Portland Sq., Carlisle, England...{	M.	Oct. 1, 1902
HOLBROOK, ELLIOT		
Chf. Engr., K. C. S. Ry., Thayer Bldg., Kansas City,		
Mo.....		Sept. 3, 1902
KENDRICK, JULIAN WAY		
City Engr., Birmingham, Ala.....		Oct. 1, 1902
MATHER, THOMAS HOGGAN		
Chf. Engr., Syracuse R. R. Constr. Co., 45 Nottingham		
Bldg., Syracuse, N. Y.....		Oct. 1, 1902
SANBORN, FRANK BERRY		
Prof. of Civ. Eng., Tufts College, Mass.....		Oct. 1, 1902
SCHALL, FREDERICK EDWARD		
Bridge Engr., Lehigh Valley R. R., South Bethlehem, Pa.		Oct. 1, 1902
SUBLETTE, GEORGE WASHINGTON		
City Engr., Minneapolis, Minn.....		Oct. 1, 1902
THOMPSON, FRED		
Civ. Engr., U. S. N., Navy Yard, Norfolk, Va.....		Oct. 1, 1902

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CHAMBERS, HERBERT JAMES			
Care, Milliken Bros., 11 Broadway, New York City.....		Nov.	5, 1902
DAVIS, LEONARD HENRY			
Chf. Asst. Engr., The Lake Superior Power Co., Sault			
Ste. Marie, Ont., Canada.....		Nov.	5, 1902
FENKELL, GEORGE HARRISON			
Civ. Engr. to Commrs. of Water-Works, Water {	Jun.	Jan.	3, 1899
Office, Erie, Pa.....} { Assoc. M.		Oct.	1, 1902
GIDEON, ABRAHAM			
27 Schnirel Bldg., Geneva, N. Y.....		Sept.	3, 1902
HALL, LOUIS WELLS			
305 Slocum Ave., Syracuse, N. Y.....		Oct.	1, 1902
HAM, WILLIAM HALE			
Engr., N. Y. Expanded Metal Co., 256 Broadway, New			
York City.....		Nov.	5, 1902
HATT, WILLIAM KENDRICK			
Prof. of Applied Mechanics, Purdue Univ., Lafayette,			
Ind.....		June	4, 1902
HENDERSON, JOHN THOMAS			
Asst. Engr., Conn. River Bridge and Highway Comm.,			
P. O. Box 702, Hartford, Conn.....		Sept.	3, 1902

		Date of Membership.
HUBBARD, WINFRED DEAN		Nov. 5, 1902
Supt. of Water-Works and Sewers, Concord, Mass.		
MITCHELL, CHARLES HAMILTON		June 4, 1902
Civ. and Hydr. Engr., Niagara Falls, Ont., Canada		
OLBERG, CHARLES REAL		
Asst. Engr., Tonopah Water & Power Co., Tonopah, Nev.	May	7, 1902
STEFFENS, WILLIAM FREDERICK		
Room 500, Grand Central Station, New York {	Jun.	Apr. 3, 1900
City.....	{ Assoc. M.	Oct. 1, 1902
WALKER, JOSEPH JEANES		
Care, American Bridge Co., 7 West 22d St., New York City	Nov.	5, 1902

JUNIORS.

ADAMS, EDWARD MAGUIRE		
1st Lieut., Corps of Engrs., U. S. A., Washington Bar- racks, Washington, D. C.	Oct.	7, 1902
BAKER, HAROLD JAMES MANNING		
408 Jefferson St., Port Townsend, Wash.	Oct.	7, 1902
BOARDMAN, HOWARD EDWARD		
227 West 33d St., New York City	Oct.	7, 1902
BURROWS, HARRY GILBERT		
Res. Engr., Div. No. 3, Atlantic Ave. Impvt., L. I. R. R., 5 Hanson Pl., Brooklyn, N. Y.	Sept.	2, 1902
DAVIS, GEORGE JACOB, Jr.		
Instructor in Civ. Eng., Univ. of Wisconsin (Res., 1104 West Johnson St.), Madison, Wis.	Nov.	4, 1902
EDWARDS, OLIVER CROMWELL, Jr.		
508 North 5th St., Steubenville, Ohio.	Oct.	7, 1902
GOULD, JOHN WARREN DU BOIS		
10 East 4th Ave., Spokane, Wash.	Oct.	7, 1902
HANEY, LEWIS TUSTLER		
Glenville, W. Va.	Oct.	7, 1902
HEALD, EDWARD CRESWELL		
P. O. Box 72, Harrisburg, Pa.	Oct.	7, 1902
HILL, STIRLING BRYANT		
46 Clark St., Auburn, N. Y.	Oct.	7, 1902
HOLLIDAY, ALEXANDER RIEMAN		
Asst. Engr., Pennsylvania Co., New Castle, Pa.	Oct.	7, 1902
HORTON, ALBERT HOWARD		
Silver Creek, N. Y.	June	3, 1902
KIMBALL, RALPH CHARLES		
Engr. in Chg. of Grade Changes, Pere Marquette R. R. Co., Evart (Res., 92 Delaware Ave., Detroit), Mich. . . .	Oct.	7, 1902
LINDSEY, KIEFFER		
Asst. City Engr., Columbus, Ga.	Oct.	7, 1902
McDONALD, HARRY PEAKE, Jr.		
Care, The Snead & Co. Iron Works, Foot of Pine St., Jersey City, N. J.	Oct.	7, 1902

		Date of Membership.
SABIN, RALPH HARVEY	Care, Eng. Dept., Chicago & Eastern Illinois R. R., Chicago, Ill.	Oct. 7, 1902
SNYDER, CHARLES HERMAN	Estimator, Cambria Steel Co., 346 Locust St., Johnstown, Pa.	Oct. 7, 1902
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minster, B. C., Canada.
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Bldg., St. Louis, Mo.

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(Res., 42 East 129th St.), New York
City.
- HARBY, ISAAC.....301 Spring St., Trenton, N. J.
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- WILCOCK, FREDERICK.....147 Columbus Ave., New York City.
- WILLIAMS, ROGER BUTLER, Jr.....315 South Albany St., Ithaca, N. Y.

DEATHS.

- DAVIS, JOHN WOODBRIDGE.....Elected Member June 3d, 1885; died November 7th, 1902.
- LATROBE, CHARLES HAZLEHURST.....Elected Member November 16th, 1870; died September 19th, 1902.
- MENDELL, GEORGE HENRY.....Elected Member September 6th, 1876; died October 19th, 1902.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(October 8th to November 11th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal, Assoc. Eng. Soc.*, 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings, Eng. Club of Phila.*, 1122 Girard St., Philadelphia, Pa.
- (3) *Journal, Franklin Inst.*, Philadelphia, Pa., 50c.
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- (52) *Proceedings, Eng. Soc. W. Pa.*, 410 Penn Ave., Pittsburg, Pa., 50c.
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- (54) *Municipal Engineering*, Indianapolis, Ind., 25c.
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- (61) *Cement and Engineering News*, Chicago, Ill., 25c.
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- Erection of the Alexandra Bridge.* H. D. Bush. (5) Vol. xv, Pt. 2.
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 Fire and Load Tests of Concrete-Steel Floors.* (14) Nov. 1.
 Corrosion of Steel Frames of Buildings. Charles L. Norton. (20) Nov. 6; (14) Nov. 8.
 Some Notes on Cement Masonry. L. N. Knapp. (Paper read before Amer. Gas-Light Assoc.) (24) Nov. 10.

Topographical.

- The United States Geological Survey Topographic Slide Rule.* Gerard H. Matthes. (7) Sept.

Water Supply.

- Masonry Dams and Retaining Walls in General, Concrete Works, etc. Chas. Baillaige. (5) Vol. xv, Pt. I.
 Inorganic and Organic Sources of Contamination of Water Supplies.* E. Starz. (1) Sept.
 The New Edinburgh Water-Works.* (12) Oct. 3.
 Feed Waters and Their Action on Boilers. Clifford A. Bowen. (26) Serial beginning Oct. 3.
 The Failure of the Water-Works Dam at Utica, N. Y.* (13) Oct. 9.

Water Supply—Continued.

- The Action of Water on Lead and Other Metallic or Metal-Lined Service Pipes. (13) Oct. 9.
 Proposed Further Development of Underground Water Supply for Brooklyn. J. M. de Varona, M. Am. Soc. C. E. (13) Oct. 9.
 The Chemical Treatment of Water.* J. C. Wm. Greth. (20) Oct. 9.
 A Reservoir Break at Camden, N. J.* (14) Oct. 11.
 The Scope and Purpose of the Irrigation Investigations of the Office of Experiment Stations. (14) Oct. 18.
 The Weston Aqueduct of the Metropolitan Water-Works, Boston.* Alfred D. Flinn. (14) Serial beginning Oct. 18.
 Meter System of the Water Department of Baltimore, Md.* Robert L. Clemmitt. (13) Oct. 30.
 The Water Supply of Rochester, N. Y. John F. Skinner. (60) Nov.
 Distributing System of the Rochester Water-Works. W. N. Radenhurst. (60) Nov.
 Modern Machinery at Shawinigan Power Plant.* (41) Nov.
 The Water Tower at Grand Rapids, Wis.* (14) Nov. 8.
 The Artesian Water Supply of Long Eaton, England. (14) Nov. 8.
 The Pike's Peak Power Plant.* (16) Nov. 8.
 Formules Pratiques Servant à Abréger les Calculs Relatifs aux Conduites Forcées dans les Projets de Distributions d'Eau.* Gustave Chenot. (30) Oct.
 Usine Hydro Électrique de Voutry (Suisse).* A. Dumas. (33) Oct. 18.

Waterways.

- Ice Formation in Canadian Waters and the Physical Laws Governing Its Formation. H. T. Barnes. (5) Vol. xv., Pt. 1.
 Tide-Gauges in Northern Climates and Isolated Situations. William Bell Dawson, Assoc. M. Inst. C. E. (63) Vol. cxlix.
 The Port of Dundee.* George Cunningham Buchanan, M. Inst. C. E. (63) Vol. cxlix.
 Sea-Wall at Woolston, Southampton.* Francis Webb Wentworth-Shields, M. Inst. C. E. (63) Vol. cxlix.
 Iron or Wooden Lock Gates; Costs of Construction and Maintenance. (13) Oct. 9.
 A Plan for Constructing Dams at Great Depths in Water-Bearing Material with Special Reference to the Bohio Dam.* J. T. Ford, M. Inst. C. E. (13) Nov. 6.
 Le Canal Interocéanique, Adoption du Projet de Colon à Panama: Note. N. V. L. Cossonx. (30) Oct.
 La Traction Électrique sur Canaux, en Allemagne.* Marcel Fabre. (33) Oct. 25.

* Illustrated.

PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS.
(INSTITUTED 1852.)

VOL. XXVIII. No. 10.
DECEMBER, 1902.

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of presentation to the Society, are given.

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Society Affairs.....Pages 341 to 364.

Papers and Discussions.....Pages 827 to 868.

NEW YORK 1902.

Entered according to Act of Congress, by the AMERICAN SOCIETY OF CIVIL ENGINEERS,
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American Society of Civil Engineers.

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The House of the Society is open from 9 A.M. to 10 P.M. every day, except Sundays Fourth of July, Thanksgiving Day and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK.

TELEPHONE NUMBER, - - - - 533 Columbus.
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AMERICAN SOCIETY OF CIVIL ENGINEERS.

INSTITUTED 1852.

PROCEEDINGS.

This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

SOCIETY AFFAIRS.

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MINUTES OF MEETINGS.

OF THE SOCIETY.

December 3d, 1902.—The meeting was called to order at 8.45 p. m., Vice-President Haines in the chair; Chas. Warren Hunt, Secretary; and present, also, 69 members and 13 guests.

The minutes of the meetings of November 5th and 19th, 1902, were approved as printed in *Proceedings* for November, 1902.

A paper, entitled "Virtual Grades for Freight Trains," by A. C. Dennis, M. Am. Soc. C. E., was presented by the Secretary, who also read a communication on the subject from B. S. Randolph, M. Am. Soc. C. E. The paper was discussed orally by Messrs. S. Maximoff, F. H. Hebblethwaite and the author.

Ballots for membership were canvassed, and the following candidates were elected:

AS MEMBERS.

EDWARD CHESTER BARNARD, Washington, D. C.
MAURICE WURTZ COOLEY, Boston, Mass.
RALPH LEE CRUMP, Kansas City, Mo.
GEORGE ROBERT FERGUSON, New York City.
MARTIN HUGHES GERRY, Jr., Helena, Mont.
WILLIAM CHAUNCEY HAWLEY, Wilkinsburg, Pa.
EDMUND TAYLOR PERKINS, Washington, D. C.

AS ASSOCIATE MEMBERS.

WILLIAM HENRY ADEY, Cohoes, N. Y.
FREDERICK AURYANSEN, Brooklyn, N. Y.
GEORGE MORGAN BACON, Salt Lake City, Utah.
CHARLES EDWIN BRIGHT, Tuscaloosa, Ala.
FRANK CHAUNCEY FRENCH, Davenport, Okla. T.
LESTER ROBINSON GIFFORD, Johnstown, Pa.
FRANK ARNOLD HASTINGS, Pittsburg, Pa.
WILLIAM NELSON HAZEN, Baltimore, Md.
ARTHUR HIRST, Pencoyd, Pa.
CLARENCE MCKENZIE LEWIS, New York City.
• THOMAS ALEXANDER ROSS, Shanghai, China.
EDWARD DE VOE TOMPKINS, Brooklyn, N. Y.
EDWARD DANA WICKES, New York City.

The Secretary announced the election of the following candidates by the Board of Direction, on December 2d, 1902:

AS ASSOCIATE.

STEDMAN BENT, Overbrook, Pa.

AS JUNIORS.

WALLACE EDWARD BELCHER, Pencoyd, Pa.
FRANCIS RIGDON BERRY, Joplin, Mo.
EDWARD BETTS BRISLEY, New York City.
ROScoe BRADBURY JACKSON, Ann Arbor, Mich.
FRANCIS JOSEPH LYNCH, New York City.
ROYAL JOHN MANSFIELD, Pittsburg, Pa.
NEAL ALBERT MELICK, New York City.
CARL JULIUS SCHUMANN, Troy, N. Y.

The Secretary announced the death of the following members:

ROBERT ATTWELL WAY, elected Member June 7th, 1894; died in April, 1901.

CHARLES FLETCHER HILLMAN, elected Member July 5th, 1876; died June 14th, 1902.

JOSEPH MILLER WILSON, elected Member April 2d, 1873; died November 24th, 1902.

HENRY MITCHELL, elected Member January 7th, 1880; died December 1st, 1902.

The Secretary announced that the Annual Convention of 1903 would be held at Asheville, N. C., during the week beginning June 8th, 1903.

Adjourned.

December 17th, 1902.—The meeting was called to order at 8.45 p.m., Emil Knichling, Director, Am. Soc. C. E., in the chair; Chas. Warren Hunt, Secretary; and present, also, 107 members and 17 visitors.

An informal discussion, on "The Sanitary Disposal of Municipal Refuse," was opened by Rudolph Hering, M. Am. Soc. C. E. The subject was discussed by Messrs. John McG. Woodbury, H. de B. Parsons and W. F. Morse, and illustrated with lantern slides.

The further discussion of the subject was postponed until the meeting of January 7th, 1903.

The Secretary announced that he had received written communications on the subject from Messrs. Charles H. Haswell and Elmer W. Firth, but that owing to the postponement of the discussion, they would be presented at the next meeting.

The Secretary announced the death of Charles Edward Henry Campbell, elected Member October 3d, 1883; died December 6th, 1902.

Adjourned.

OF THE BOARD OF DIRECTION.

(Abstract.)

December 2d, 1902.—Vice-President Haines in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Briggs, Croes, Knap, Knichling, Osborn, Pegram, Schneider, Seaman and Swain.

Four members were named as Members of the Board of Award of the John Fritz Medal.*

Upon the recommendation of a Special Committee appointed for the purpose, it was decided that the next Annual Convention of the Society be held at Asheville, N. C., during the week beginning June 8th, 1903.

A Committee of Arrangements for the Annual Meeting was appointed.

Applications for membership were considered, and other routine business transacted.

One candidate for Associate and eight for Junior were elected.†
Adjourned.

* See page 346.

† See page 342.

ANNOUNCEMENTS.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

MEETINGS.

Wednesday, January 7th, 1903.—8.30 p. m.—A regular business meeting will be held. Ballots for membership will be canvassed, and the discussion on the topic "The Sanitary Disposal of Municipal Refuse," which took place at the meeting of December 17th, 1902, will be continued.

ANNUAL MEETING.

The Fiftieth Annual Meeting will be held at the Society House, January 21st and 22d, 1903. The Business Meeting will be called to order at 10 o'clock on Wednesday morning. The annual reports will be presented, officers for the ensuing year elected, members of the Nominating Committee appointed, a proposed amendment to the Constitution considered, and other business transacted.

Arrangements for the excursions and entertainments have been placed in the hands of the following committee, and will be announced later:

ALFRED CRAVEN,
W. F. WHITTEMORE,
CHAS. WARREN HUNT.

ANNUAL CONVENTION OF 1903.

The Thirty-fifth Annual Convention of the Society will be held at Asheville, N. C., during the week beginning June 8th, 1903.

NOMINATING COMMITTEE.

The Constitution provides that, at the Annual Meeting of each year, seven Corporate Members, not officers of the Society, one from each of the geographical districts into which the Society is divided for this purpose, shall be appointed by the meeting to serve for two years.

The usual blank request for suggestions as to representatives of each district, for presentation to the meeting, has been mailed to Corporate Members.

LOUISIANA PURCHASE EXPOSITION.

The Board of Direction, at its meeting on November 4th, 1902, authorized the appointment of a committee to take up the question of an exhibit, in the name of the Society, at the World's Fair, St. Louis, 1904; and also to take such action as may be deemed necessary in interesting members of the Society in general in an engineering exhibit.

The committee appointed for this purpose is as follows:

ROBERT MOORE,
JOHN F. WALLACE,
E. KUCHLING,
MORDECAI T. ENDICOTT,
EDWARD C. CARTER,
WILLIAM JACKSON,
JAMES L. FRAZIER.

THE JOHN FRITZ MEDAL.

The Board of Direction, in accordance with the terms of Clause 6 of the following rules for the award of this medal, has named the following members of the Society as members of the Board of Award:

To serve one year, J. James R. Croes.
" " two years, Robert Moore.
" " three " Alfred Noble.
" " four " Chas. Warren Hunt.

ORIGIN AND RULES FOR THE AWARD OF THE JOHN FRITZ MEDAL.

(1) The John Fritz Medal was established by the professional associates and friends of John Fritz, of Bethlehem, Pa., U. S. A., August 21st, 1902, his eightieth birthday, to perpetuate the memory of his achievements in industrial progress.

(2) The medal shall be awarded for notable scientific or industrial achievement. There shall be no restriction on account of nationality or sex.

(3) The medal shall be of gold (of.....ounces weight andfineness), and shall be accompanied by an engraved certificate, which shall recite the origin of the medal, and the specific achievement for which the award is made. Such certificate shall be signed by the Chairman and the Secretary of the Board of Award.

(4) The medal may be awarded annually, but not oftener.

(5) No award of the medal shall be made to any one whose eligibility to the distinction has not been under consideration by the Board of Award for at least one year.

(6) Awards shall be made by a Board of sixteen, appointed or chosen, in equal numbers, from the membership of the four National Societies: The American Society of Civil Engineers, The American Institute of Mining Engineers, The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. The governing bodies of each of these societies shall be requested to appoint from its membership one representative who shall hold office for one year, one for two years, one for three years, and one for four years; and each succeeding year to appoint one member to serve for four years.

(7) In case of failure of any of the National Societies to make the original appointments as requested, the selection of representatives from its membership shall be made by those appointed from the other societies, and should any future vacancy occur by reason of the failure of any of the said societies to act, or otherwise, such vacancy shall be filled by the Board of Award, from the membership of the Society so failing.

(8) Should one or more of the four National Societies go out of existence, its representation on the Board shall cease and terminate, and future awards shall be made by the representatives of the remaining societies.

(9) The vote of the Board of Award shall be by letter-ballot, which shall be canvassed not less than thirty days subsequent to its issue, and the affirmative votes of at least three-fourths of the Board shall be necessary for an award.

ACCESSIONS TO THE LIBRARY.

From November 12th to December 9th, 1902.

DONATIONS.*

THE SCIENCE OF MECHANICS.

A Critical and Historical Account of its Development. By Dr. Ernst Mach. Translated from the German by Thomas J. McCormack. Second Revised and Enlarged Edition. Cloth, 8 x 6 ins., 19 + 605 pp., illus. Chicago, The Open Court Publishing Company, 1902. \$2.00.

The preface states that the present volume is not a treatise upon the application of the principles of mechanics. Its aim is to clear up ideas, expose the real significance of the matter, and get rid of metaphysical obscurities. The little mathematics it contains is merely secondary to this purpose. The text of the present edition, which contains the extensive additions made by the author to the latest German editions, has been thoroughly revised by the translator. All errors, either of substance or typography, so far as they have come to the translator's notice, have been removed, and in many cases the phraseology has been altered. The author's additions have been relegated to the appendix, first, because the numerous references in other works to the pages of the first edition thus hold good for the present edition also, and secondly, because with few exceptions the additions are either supplementary in character, or in answer to criticisms. The Contents are: The Development of the Principles of Statics; The Development of the Principles of Dynamics; The Extended Application of the Principles of Mechanics and the Deductive Development of the Science; The Formal Development of Mechanics; The Relation of Mechanics to other Departments of Knowledge. There is an index of twelve pages.

FOWLER'S MECHANICAL ENGINEER'S POCKET-BOOK FOR 1903.

Edited by William H. Fowler, M. Inst. C. E., M. I. Mech. E., M. Iron and Steel Inst. Leather, 6 x 4 ins., 441 pp., illus. Scientific Publishing Co., Manchester. 2 shillings 6 pence.

The preface states that in the present edition extensive additions and emendations have been made, with a view to keep it fully abreast with the times. Numerous new tables, calculated to help the engineer in his daily work, have been included, while substantial additions have been made in the section on steam boilers and engines, embodying the latest information available respecting recent developments in connection with superheating, oil-burning, water-tube boilers, etc. The gas engine section has also been thoroughly revised, and much original matter, with many tables, is here published for the first time. With a field so wide as mechanical engineering, with its continual discoveries and ever-growing experience, any reference book of this kind must, of necessity, be incomplete in some directions. The difficulty is to make a selection which will meet the daily requirements of the average engineer without being inconvenient or unwieldy. This is the object the author has kept in view, and he trusts, in some measure, has succeeded in fulfilling. There is an index of fifty-five pages.

GENERAL SPECIFICATIONS FOR FOUNDATIONS AND SUPERSTRUCTURES

Of Highway and Electric Railway Bridges. By Theodore Cooper. Paper, 9½ x 7 ins., 24 pp., 13 plates. The Engineering News Publishing Company, New York, 1902. \$1.00. (Donated by the Author.)

The author states in the preface that he has herewith endeavored to illustrate the more common forms of superstructures and foundations suitable for highway bridges, and gives the required proportions for all ordinary cases, with instructions and specifications for their construction. The author excludes from consideration difficult foundations in deep water, or those requiring pneumatic or other special appliances, or works of such expense as would demand especial study of the conditions to determine the best or most economical solution; also city bridges and long-span bridges, where a higher and more elaborate class of substructure may be demanded and justified.

THE COAL AND METAL MINERS' POCKET-BOOK

Of Principles, Rules, Formulas, and Tables. Specially Compiled and Prepared for the Convenient Use of Mine Officials, Mining Engineers,

* Unless otherwise specified, books in this list have been donated to the Library by the Publisher.

and Students Preparing Themselves for Certificates of Competency as Mine Inspectors or Mine Foremen. Seventh Edition; Revised and Enlarged, with Original Matter. Leather, 7 x 4 ins., 12 + 637 pp., illus. Scranton, Pa., International Textbook Company, 1902. \$3.00. (Donated by *Mines and Minerals*.)

The preface states that the speedy exhaustion of the sixth edition has made this present edition necessary. In it a few typographical errors in the previous edition have been corrected, all departments have been carefully revised, improved, and brought up to date, and considerable new matter has been added. The glossary, which contains about 2500 words, is a combination of all mining glossaries extant of which the compilers could hear. The Contents are: Weights and Measures; Applied Mechanics; Forms of Power; Mining. There is an index of seventeen pages.

CITY BENCH MARKS, HARTFORD, CONN.

Published by Frederick L. Ford, City Engineer, under the Directions of the Board of Street Commissioners. Leather, 7 x 3½ ins., 95 pp. Hartford, 1902. (Donated by Frederick L. Ford.)

The preface states that the benches contained in this book were established by the City Engineer during the years 1900 and 1901. The old and new systems should correspond approximately, both being referred to the same datum. If any errors between individual benches on the two systems exist, they are due to changes which have taken place in the structures upon which the old benches were established.

RAILWAY TRACK AND TRACK WORK.

By E. E. Russell Tratzman, M. Am. Soc. C. E. Second Edition. Cloth, 9 x 6 ins., 4 + 471 + 9 pp., illus. New York, The Engineering News Publishing Co. \$3.00. (Donated by the author.)

The present edition has been almost entirely rewritten and set up in new type. Since 1897, many changes and improvements have been made in materials and methods, while, with the general progress made in this department, new standards have been adopted, and these various improvements are represented in the revision. Not only has the book been thoroughly revised, but many new illustrations have been made, and additional chapters have been added dealing with signals, interlocking, and street-railway track. The tables of standard track construction in the appendix are also entirely new. A special feature of the book is that it includes not only the general principles underlying track work, and the systems of practice which are everywhere applicable, but also includes numerous individual details of material, appliances and work, and methods of practice, which vary on different railways and in different sections of the country. It has been the author's special aim to present drawings and details of materials and methods, representing varied and actual practice, and to show their good and bad features, as well as the reasons for their use. The chapter headings are: Introduction; Roadbed Construction; Ballast; Ties and Tie Plates; Rails; Rail Fastenings and Rail-Joints; Switches, Frogs and Switchboards; Fences and Cattle-Guards; Bridge Floors and Grade Crossings; Track Signs; Tanks and Other Track Accessories; Sidings, Yards and Terminals; Track Tools and Supplies; Signals and Interlocking; Street Railway Track; Organization of Maintenance-of-Way Department; Track-laying and Ballasting; Drainage and Ditching; Track Work for Maintenance; Gage, Grades and Curves; Track Inspection and the Premium System; Switch Work and Turnouts; Bridge Work and Telegraph Work; Permanent Improvements and Work Trains; Handling and Cleaning Snow; Wrecking Trains and Operations; Records, Reports, and Accounts; Table of Standard Track Construction on 50 Railways; Table of Train Speeds and Distances Run. There is an index of nine pages.

STEREOTOMY.

By Arthur W. French, Assoc. M. Am. Soc. C. E., and Howard C. Ives, Jun. Am. Soc. C. E. Cloth, 9 x 6 ins., 7 + 115 pp., illus. New York, John Wiley & Sons, 1902. \$2.50.

It is believed by the authors that, for some time, there has been a need for a textbook on stereotomy which should furnish, in addition to the exercises in projections now given by a number of works, practical examples of modern masonry structures, directions for the preparation of drawings which are made daily by engineers and architects, and more of the practical detail of building stone masonry. No claim is made for originality in the text, the aim of the authors having been to select matter from older works, to condense where possible, add explanations where it was deemed necessary, and to bring together matter which has been found scattered through many works. The chapter headings are: Definitions and Classifications; Stone-Cutting; Plane-Sided Structures; Structures Containing Developable Surfaces; The Oblique or Skew Arch; Other Problems. There is an index of three pages.

Gifts have also been received from the following:

- | | |
|---|---|
| Am. Electrochemical Soc. 1 bound vol. | McKim, Alex. Rice. 1 vol. |
| Am. Soc. of Mech. Engrs. 1 bound vol. 17
pam. | McMinn, T. J. 1 pam. |
| Ariz. Agri. Exper. Station. 1 pam. | Madras, India—Pub. Works Dept. 1
pam. |
| Baltimore & Ohio R. R. Co. 1 pam. | Minneapolis & St. Louis R. R. Co. 1 pam. |
| Baltimore, Chesapeake & Atlantic Ry.
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| Biddle, John. 1 pam. | North of England Inst. of Min. and Mech.
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1 bound vol. |
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pam. | U. S. Corps of Engrs. 28 specif. |
| Inst. of Engrs. and Shipbuilders in Scot-
land. 1 bound vol. | U. S. Surgeon General. 1 vol. |
| Johnson, L. J. 1 pam. | Waddell, John. 1 pam. |
| Long Island R. R. Co. 1 pam. | Webster, George S. 1 bound vol. |

BY PURCHASE.

**La Navigation Sous-Marine à travers les Siècles, d'après de Nom-
breux Documents Inédits.** Par Maurice Delpuech. Paris, Félix
Juven.

Le Scaphandre. Son Emploi. Par M. Dibos. Paris, Gauthier-
Villars.

Grundriss der Electrotechnik für den praktischen Gebrauch,
für Studierende der Electrotechnik und zum Selbststudium. Ver-
fasst von Heinrich Kratzert. Vol. 2, Pts. 2-5. Leipzig und Wien,
Franz Deuticke, 1902.

Die Telegraphie ohne Draht. Von Adolf Prasch. Wien, Pest,
Leipzig, A. Hartleben, 1902.

**Die Geschichte des Eisens in technischer und kulturgeschichtlicher
Beziehung.** Von Ludwig Beck. Vol. 5, Pt. 7. Braunschweig,
Friedrich Vieweg und Sohn, 1902.

**Report of the Chief Signal Officer of the Army, 1872, '75-'80, '83-
92.** Washington, Government Printing Office, 1872-93.

American Industrial Conditions and Competition. Reports of the
Commissioners Appointed by the British Iron Trade Association to
Enquire into the Iron, Steel and Allied Industries of the United
States. Edited by J. Stephen Jeans. London, British Iron Trade
Association, 1902.

Handbuch der Ingenieurwissenschaften. Vol. 5, Pt. 7. Leipzig,
Wilhelm Engelmann, 1902.

Duncan's Manual of Tramways, Omnibuses and Electric Railways
of the United Kingdom and the Foreign and Colonial Companies that
are Registered in England, Shewing the Dates of Incorporation, and

where Fixed and Ascertainable, the Dates at which their Leases or Concessions Terminate, with Abstracts of Accounts, Directory of Directors, Officials, Firms and Individuals Connected therewith, and Extract of Tramways Act and Bye-Laws—Board of Trade and Metropolitan. Twenty-Fifth Edition. London, T. J. Whiting & Sons, Limited, 1902.

SUMMARY OF ACCESSIONS.

From November 12th to December 9th, 1902.

Donations (including 1 duplicate and 1 number completing volume of periodical)	116
By Purchase	28
Total.....	144

MEMBERSHIP.**ADDITIONS.****MEMBERS.**

		Date of Membership.
CRUMP, RALPH LEE		Dec. 3, 1902
Keith and Perry Bldg., Kansas City, Mo.....		
FERGUSON, GEORGE ROBERT		
Asst. Engr., Dept. of Bridges, 1215 Park Row Bldg., New York City.....		Dec. 3, 1902
HAWLEY, WILLIAM CHAUNCEY	Jun. Assoc. M.	Oct, 1, 1890 Apr. 6, 1892
Chf. Engr. and Gen. Supt., Pennsylvania Water Co., 701 Wood St., Wilkinsburg, Pa...	M.	Dec. 3, 1902
HOUGH, ULYSSES B		
Mech. Engr., Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho.....		Nov. 5, 1902
KLUEGEL, CHARLES HENRY		
Chf. Engr., Oahu Ry. & Land Co.; Hilo R. R. Co., P. O. Box 796, Honolulu, Hawaiian Islands.....		Oct. 1, 1902
WEST, CHARLES HUNTER		
Chf. Engr., Mississippi Levee Dist., Greenville, Miss.....		Oct. 1, 1902

ASSOCIATE MEMBERS.

ADEY, WILLIAM HENRY	Jun. Assoc. M.	Feb. 4, 1896 Dec. 3, 1902
181 Main St., Cohoes, N. Y.		
DAVIS, FRED RUFUS		
Res. Engr., Indiana Branch, Buffalo, Rochester & Pittsburg Ry. Co., Juneau, Pa.....		Nov. 5, 1902
DUFOUR, FRANK OLIVER		
Prof. of Civ. Eng., Univ. of Cincinnati, Cincinnati, Ohio	Jun. Assoc. M.	Dec. 5, 1899 Oct. 1, 1902
GIFFORD, LESTER ROBINSON		
Office of Structural Engr., Cambria Steel Co., Johnstown, Pa.....	Jun. Assoc. M.	Mar. 3, 1896 Dec. 3, 1902
GRISWOLD, RAY ELLIOTT		
Care, Barber Asphalt Paving Co., 11 Broadway, New York City.....		Oct. 1, 1902
HASTINGS, FRANK ARNOLD		
21 Mawhinney St., Pittsburgh, Pa		Dec. 3, 1902
HIRST, ARTHUR		
Asst. Engr., Eng. Dept., American Bridge Co., 163 Harvey St., Wissahickon, Philadelphia, Pa		Dec. 3, 1902
LANE, EDWIN GRANT		
Asst. Div. Engr., B. & O. R. R., Cumberland, Md.....		Jan. 8, 1902
LEWIS, CLARENCE MCKENZIE		
Care, Win. Solomon & Co., 25 Broad St., New York City...		Dec. 3, 1902

		Date of Membership.
LIVERMORE, NORMAN BANKS	{ Jun.	Dec. 5, 1899
320 Sansome St., San Francisco, Cal.....	{ Assoc. M.	Oct. 1, 1902
PEMOFF, JOEL JUK		
Asst. Engr., Dept. of Docks and Ferries, Pier A, North River, New York City.....		Nov. 5, 1902
RAMSEY, EDMUND PAYTON		
Asst. Engr., 1st Div., Rapid Transit R. R.	{ Jun.	Feb. 6, 1900
Comm. (Res., 11 Flushing Ave., Brooklyn), N. Y.....	{ Assoc. M.	Oct. 1, 1902

ASSOCIATE.

BENT, STEDMAN		
Purchasing Agt., The Penna. Steel Co., Overbrook, Mont- gomery Co., Pa.....		Dec. 2, 1902

JUNIORS.

ARMSTRONG, ALEXANDER FLOYD		
Manila, Philippine Islands ..		Oct. 7, 1902
BRISLEY, EDWARD BETTS		
Chf. Engr's Office, Manhattan Ry. Co., 102 West 75th St., New York City.....		Dec. 2, 1902
BERRY, FRANCIS RIGDON		
Care, Water Co., Birmingham, Ala.....		Dec. 2, 1902
JACKSON, ROSCOE BRADEURY		
Asst. to Dean, Dept. of Eng., Univ. of Mich., 607 Hill St., Ann Arbor, Mich.....		Dec. 2, 1902
MANSFIELD, ROYAL JOHN		
7724 Hamilton Ave., Pittsburg, Pa.....		Dec. 2, 1902
MELICK, NEAL ALBERT		
Room 512, Grand Central Station, New York City.....		Dec. 2, 1902
ORTIZ, EDUARDO		
P. O. Box 2020, City of Mexico, Mexico		Nov. 4, 1902
PARKER, RICHARD DENNY		
Asst. Engr., I. & G. N. R. R., Palestine, Tex.....		June 3, 1902
PROCTOR, RALPH FENNO		
U. S. Junior Engr., Campau Bldg., Detroit, Mich		June 3, 1902
RHETT, EDMUND MOORE		
1st Lieut., Corps of Engrs., U. S. A., Washington Barracks, D. C.		Nov. 4, 1902
SCHUMANN, CARL JULIUS		
3 Union Pl., Troy, N. Y.....		Dec. 2, 1902
WEAVER, FRANK MAURICE		
1813 North 15th St., Philadelphia, Pa.....		Nov. 4, 1902

DEATHS.

CAMPBELL, CHARLES EDWARD HENRY....	Elected Member October 3d, 1883; died December 6th, 1902.
DAVIS, JOHN WOODBRIDGE.....	Elected Associate June 3d, 1885; died November 7th, 1902.

- HILLMAN, CHARLES FLETCHER..... Elected Member July 5th, 1876; died June 14th, 1902.
- MITCHELL, HENRY..... Elected Member January 7th, 1880; died December 1st, 1902.
- WAY, ROBERT ATTWELL..... Elected Member June 7th, 1893; died April, 1901.
- WILSON, JOSEPH MILLER..... Elected Member April 2d, 1873; died November 24th, 1902.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST.

(November 12th to December 9th, 1902.)

NOTE.—*This list is published for the purpose of placing before the members of the Society the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS.

In the subjoined list of articles references are given by the number prefixed to each journal in this list.

- (1) *Journal*, Assoc. Eng. Soc., 257 South Fourth St., Philadelphia, Pa., 30c.
- (2) *Proceedings*, Eng. Club of Phila., 1122 Girard St., Philadelphia, Pa.
- (3) *Journal*, Franklin Inst., Philadelphia, Pa., 50c.
- (4) *Journal*, Western Soc. of Engrs., Moshnadock Block, Chicago, Ill.
- (5) *Transactions*, Can. Soc. C. E., Montreal, Que., Canada.
- (6) *School of Mines Quarterly*, Columbia Univ., New York City, 50c.
- (7) *Technology Quarterly*, Mass. Inst. Tech., Boston, Mass., 75c.
- (8) *Stevens Institute Indicator*, Stevens Inst., Hoboken, N. J., 50c.
- (9) *Engineering Magazine*, New York City, 25c.
- (10) *Cassier's Magazine*, New York City, 25c.
- (11) *Engineering* (London), W. H. Wiley, New York City, 25c.
- (12) *The Engineer* (London), International News Co., New York City, 35c.
- (13) *Engineering News*, New York City, 15c.
- (14) *The Engineering Record*, New York City, 12c.
- (15) *Railroad Gazette*, New York City, 10c.
- (16) *Engineering and Mining Journal*, New York City, 15c.
- (17) *Street Railway Journal*, New York City, 35c.
- (18) *Railway and Engineering Review*, Chicago, Ill., 10c.
- (19) *Scientific American Supplement*, New York City, 10c.
- (20) *Iron Age*, New York City, 10c.
- (21) *Railway Engineer*, London, England, 25c.
- (22) *Iron and Coal Trades Review*, London, England, 25c.
- (23) *Bulletin*, American Iron and Steel Assoc., Philadelphia, Pa.
- (24) *American Gas Light Journal*, New York City, 10c.
- (25) *American Engineer*, New York City, 20c.
- (26) *Electrical Review*, London, England.
- (27) *Electrical World and Engineer*, New York City, 10c.
- (28) *Journal*, New England Water-Works Assoc., Boston, \$1.
- (29) *Journal*, Society of Arts, London, England, 15c.
- (30) *Annales des Travaux Publics de Belgique*, Brussels, Belgium.
- (31) *Annales de l'Assoe. des Ing. Sortis des Ecole Spéciales de Gand*, Brussels, Belgium.
- (32) *Mémoires et Compte Rendus des Travaux*, Soc. Ing. Civ. de France, Paris, France.
- (33) *Le Génie Civil*, Paris, France.
- (34) *Portefeuille Économique des Machines*, Paris, France.
- (35) *Nouvelles Annales de la Construction*, Paris, France.
- (36) *La Revue Technique*, Paris, France.
- (37) *Revue de Mécanique*, Paris, France.
- (38) *Revue Générale des Chemins de Fer et des Tramways*, Paris, France.
- (39) *Railway Master Mechanic*, Chicago, Ill., 10c.
- (40) *Railway Age*, Chicago, Ill., 10c.
- (41) *Modern Machinery*, Chicago, Ill., 10c.
- (42) *Transactions*, Am. Inst. Elec. Engrs., New York City, 50c.
- (43) *Annales des Ponts et Chaussées*, Paris, France.
- (44) *Journal*, Military Service Institution, Governor's Island, New York Harbor, 50c.
- (45) *Mines and Minerals*, Scranton, Pa., 20c.
- (46) *Scientific American*, New York City, 8c.
- (47) *Mechanical Engineer*, Manchester, England.
- (48) *Transactions*, Am. Soc. C. E., New York City, \$5.
- (49) *Transactions*, Am. Soc. M. E., New York City, \$10.
- (50) *Transactions*, Am. Inst. Min. Engrs., New York City, \$5.
- (51) *Colliery Guardian*, London, England.
- (52) *Proceedings*, Eng. Soc. W. Pa., 410 Penn Ave., Pittsburg, Pa., 50c.
- (53) *Transactions*, Mining Inst. of Scotland, London and Newcastle-upon-Tyne.
- (54) *Municipal Engineering*, Indianapolis, Ind., 25c.
- (55) *Proceedings*, Western Railway Club, 225 Dearborn St., Chicago, Ill., 25c.
- (56) *American Manufacturer and Iron World*, 59 Ninth St., Pittsburg, Pa.
- (57) *Minutes of Proceedings*, Inst. C. E., London, England.
- (58) *Poover*, New York City, 20c.
- (59) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.
- (60) *Journal of Gas Lighting*, London, England, 15c.
- (61) *Cement and Engineering News*, Chicago, Ill., 25c.
- (62) *Mining Journal*, London, England.

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 The Reasons for the Change of the Navy Standard Voltage from 80 to 125. W. V. N. Powelson. (42) Oct.
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 A Method of Determining the Temperature of Exhaust Gases.* R. H. Fernald. (55) Vol. xxiii.
 Working Details of a Gas Engine Test.* R. H. Fernald. (55) Vol. xxiii.
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 Specifications for Steel forgings, Steel Castings and Steel Boiler Plates.* William R. Webster. (55) Vol. xxiii.
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 The Bursting of Small Cast-Iron Fly-Wheels.* Charles H. Benjamin. (55) Vol. xxiii.
 An Experiment on the Effect of Clearance on the Economy of a Small Steam Engine.* Albert Kingsbury. (55) Vol. xxiii.
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* Illustrated.

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AMERICAN SOCIETY
OF
CIVIL ENGINEERS.

INSTITUTED NOVEMBER 5, 1852.

CONSTITUTION AND LIST OF
MEMBERS.

FEBRUARY 10TH, 1902.

HOUSE OF THE SOCIETY, 220 WEST FIFTY-SEVENTH STREET,
NEW YORK.

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HOUSE OF THE SOCIETY,

220 West 57th Street.

Cable Address:
"Ceas, New York."

Telephone:
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CALENDAR.

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FEBRUARY							JUNE							OCTOBER							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
..	1	1	2	3	4	5	6	7	1	2	3	4
2	3	4	5	6	7	8	8	9	10	11	12	13	14	5	6	7	8	9	10	11	
9	10	11	12	13	14	15	15	16	17	18	19	20	21	12	13	14	15	16	17	18	
16	17	18	19	20	21	22	22	23	24	25	26	27	28	19	20	21	22	23	24	25	
23	24	25	26	27	28	..	29	30	..	..	..	..	..	26	27	28	29	30	31	..
..	
MARCH							JULY							NOVEMBER							
..	..	..	..	..	..	..	1	..	1	2	3	4	5	..	..	..	..	..	..	1
2	3	4	5	6	7	8	6	7	8	9	10	11	12	2	3	4	5	6	7	8	
9	10	11	12	13	14	15	13	14	15	16	17	18	19	9	10	11	12	13	14	15	
16	17	18	19	20	21	22	20	21	22	23	24	25	26	16	17	18	19	20	21	22	
23	24	25	26	27	28	29	27	28	29	30	31	..	..	23	24	25	26	27	28	29
30	31	..	..	..	..	..	..	..	..	..	..	..	..	30	..	..	..	..	..	..
APRIL							AUGUST							DECEMBER							
..	..	1	2	3	4	5	..	..	..	..	..	1	2	..	1	2	3	4	5	6
6	7	8	9	10	11	12	3	4	5	6	7	8	9	7	8	9	10	11	12	13	
13	14	15	16	17	18	19	10	11	12	13	14	15	16	14	15	16	17	18	19	20	
20	21	22	23	24	25	26	17	18	19	20	21	22	23	21	22	23	24	25	26	27	
27	28	29	30	..	..	..	24	25	26	27	28	29	30	28	29	30	31	..	..	..
..	..	..	..	..	..	..	31	..	..	..	..	..	..	..	..	..	..	..	..	..
MAY							SEPTEMBER							JANUARY							
..	..	..	1	2	3	..	..	1	2	3	4	5	6	..	..	..	1	2	3	..
4	5	6	7	8	9	10	7	8	9	10	11	12	13	4	5	6	7	8	9	10	
11	12	13	14	15	16	17	14	15	16	17	18	19	20	11	12	13	14	15	16	17	
18	19	20	21	22	23	24	21	22	23	24	25	26	27	18	19	20	21	22	23	24	
25	26	27	28	29	30	31	28	29	30	..	..	..	..	25	26	27	28	29	30	31
..	

NOTE.—Regular meetings are called to order at 8.30 P. M.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

The Annual Convention will be held at Washington, D. C., on May 20th, 21st, 22d and 23d, 1902.

CONSTITUTION.

ADOPTED MARCH 4TH, 1891.*

ARTICLE I.—NAME, LOCATION AND OBJECT.

1.—The name of this Association shall be the AMERICAN SOCIETY OF CIVIL ENGINEERS.

2.—The offices of the Society shall be located in the City of New York.

3.—Its objects shall be the advancement of engineering knowledge and practice and the maintenance of a high professional standard among its members.

4.—Among the means to be employed for this purpose shall be: meetings for the presentation and discussion of appropriate papers and for social and professional intercourse; the publication of such papers and discussions as may be deemed expedient; the maintenance of a library, the collection of maps, drawings and models, and the establishment of facilities for their use.

ARTICLE II.—MEMBERSHIP.

1.—The Corporate Members of this Society shall be designated as Members and Associate Members. There may also be connected with the Society, Honorary Members, Associates, Juniors and Fellows who shall be entitled to all the privileges of the Society, except the right to vote and to hold office therein; provided that Honorary Members elected from the Corporate Members of the Society shall retain their right to vote and to hold office.

2.—A Member shall be a Civil, Military, Naval, Mining, Mechanical, Electrical, or other professional Engineer, an Architect or a Marine Architect. He shall be at the time of admission to membership not less than thirty years of age, and shall have been in the active practice of his profession for ten years; he shall have had responsible charge of work for at least five years, and shall be qualified to design as well as to direct engineering works. Graduation from a school of engineering of recognized reputation shall be considered as equivalent to two years' active practice. The performance of the duties of a Professor of Engineering in a technical school of a high grade shall be taken as an equivalent to an equal number of years of actual practice.

*Amended October 3d, 1894; March 6th, 1895; October 6th, 1897; October 5th, 1898, and October 3d, 1909.

3.—An Associate Member shall be a professional Engineer or Architect not less than twenty-five years of age, who shall have been in the active practice of his profession for at least six years, and who shall have had responsible charge of work as principal or assistant for at least one year. Graduation from a school of engineering of recognized reputation shall be considered as equivalent to two years' active practice.

4.—Any person having the necessary qualifications prescribed in this article to entitle him to admission to the grades of Member or Associate Member, shall be eligible for such membership, though he may not be practicing his profession at the time of making his application.

5.—An Associate shall be a person who, by scientific acquirements or practical experience, has attained a position in his special pursuit qualifying him to co-operate with engineers in the advancement of professional knowledge and practice, but who is not a professional engineer.

6.—A Junior shall be not less than eighteen years of age, and his connection with the Society shall cease when he becomes thirty years of age, unless he be previously transferred to another grade. He shall have had active practice in some branch of engineering for at least two years, or he shall have graduated from a school of engineering of recognized standing. He shall state in his application for membership that he intends to become or to continue to be an engineer. Persons who are in the Junior class at the time of the adoption of this Constitution shall not have their status changed by the provisions of this section.

7.—Honorary Members shall be chosen only from persons of acknowledged eminence in some branch of engineering or the sciences related thereto. There shall not be more than twenty at any one time.

8.—Fellows shall be contributors to the permanent funds of the Society, though they may not be eligible for admission as Corporate Members.

ARTICLE III.—ADMISSIONS AND EXPULSIONS.

1.—Honorary Members shall be proposed by at least ten members, and shall be elected only by a unanimous vote of the Board of Direction. A Past-President, or a member of the Board of Direction proposed for Honorary Membership, shall not be required to vote either for or against his own admission.

A person elected an Honorary Member shall be promptly notified thereof by letter. The election shall be canceled if an acceptance is not received within six months after the mailing of such notice.

2.—An application for admission to the Society as Member or as Associate Member, or for transfer from any other grade to either grade of Corporate Membership, shall embody a concise statement, with dates, of the candidate's professional training and experience; and shall be in a form and in such detail as may be prescribed by the Board of Direction. It shall be signed by the applicant, and shall contain a promise to conform to the requirements of membership, if elected. The applicant shall furnish the names of at least five Corporate Members to whom he is personally known. Each of these shall be requested by the Secretary to address a letter to the Board of Direction, on a form prescribed by said Board, stating the extent of the writer's personal knowledge of the applicant and of his professional work. If at least five of the

Corporate Members named as references do not furnish the requisite endorsement, the Secretary shall call upon the applicant for additional names, and not until written communications shall have been received from at least five Corporate Members shall the application be considered by the Board.

Applications of engineers not resident in North America, and who may be so situated as not to be personally known to five Corporate Members, may be recommended for ballot by five members of the Board of Direction, after having secured evidence sufficient, in their opinion, to show that the applicant is worthy of admission.

3.—At stated periods, to be determined by the Board of Direction, there shall be issued to each member in any grade whose address is known, a list of all new applications received for membership in any grade or for transfer from one grade to another, which list shall be dated and shall contain a concise statement of the record of each applicant and the names of the references in the case of Corporate Member, and endorsers in the case of Associate, Junior or Fellow, with a request that members transmit to the Board any information in their possession which may affect the disposition of the applications. Not less than twenty days after the issue of such list, the Board of Direction shall consider these applications, together with any information in regard to the applicants that may have been received; may make further inquiries, if deemed expedient; may classify the applicant with his consent, and on applications for Corporate Membership may direct a ballot.

4.—The ballots shall be letter-ballots, in a form to be prescribed by the Board of Direction. They shall be mailed to each Corporate Member whose address is known, and shall state the date on which the ballot is to be canvassed, which shall be not less than twenty days after the issue of the ballot. Seven or more negative votes shall exclude from election. In case of exclusion no notice thereof shall be entered on the minutes, but the candidate shall be notified.

5.—The Board of Direction, upon receipt of letters from not less than eight Corporate Members in good standing, requesting a reconsideration of the ballot on any excluded candidate, and stating the reasons for such request, shall consider these reasons, and if the Board deems them sufficient, it shall cause a notice to be mailed to each Corporate Member whose address is known, giving the name and record of the applicant, and the names of those who ask a reconsideration. This notice shall include a request that any member having information which might aid in a proper consideration of the application, will at once transmit such information to the Board of Direction.

Not less than twenty days after the issue of this notice, the Board shall again consider the request with any additional information that may have been received, and it may continue the inquiry so as to secure the fullest information. If the Board decides that the reasons for a reconsideration are sufficient, it shall order another ballot to be taken. A letter-ballot, in a form to be prescribed by the Board, shall then be mailed to each Corporate Member whose address is known. Each ballot shall be signed by the member who votes it. The returns shall be canvassed by the Board, at a meeting to be held not less than twenty days after the blank ballots shall have been mailed by the Secretary.

Negative votes to the number of ten per cent. of those cast shall exclude. In case of exclusion, no notice thereof shall be entered in the minutes, but the candidate shall be notified.

The request for reconsideration of a ballot must be presented within one year after the date of the original canvass of such ballot.

6.—An application for admission as Associate, Junior or Fellow shall be in a form to be prescribed by the Board of Direction; shall embody a statement of the applicant's qualifications for the grade of membership to which admission is sought and a promise to conform to its requirements. The application shall be signed by the applicant, and it shall be indorsed by at least three Corporate Members, who shall certify that they personally know the applicant, that they believe him to be in all respects a proper person to be admitted to the Society, and that they recommend him for admission.

7.—The Board of Direction, after making such inquiries as it may deem expedient, shall have the power to elect persons so proposed, as Associates, Juniors or Fellows; and shall notify the membership of its action.

8.—All elected candidates shall be duly notified and shall subscribe to the Constitution and Rules of the Society. Forms for these purposes shall be prescribed by the Board of Direction. If these provisions are not complied with within six months from the notification of election, such election shall be considered void, unless for special reason the time shall be extended by the Board of Direction.

Membership of any person shall date from the day of his election.

9.—Upon the written request of ten or more Corporate Members, that for cause therein set forth a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and, if there appears to be sufficient reason, shall advise the accused of the charges against him. He may, if he so desires, present a written defense which shall be considered at a meeting of the Board of Direction, of which he shall receive due notice. Not less than two months after such meeting, the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a defense made which is satisfactory to the Board, it shall then notify the person that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Corporate Members by letter-ballot in a form to be prescribed by the Board of Direction. The ballot shall be accompanied by a statement of the charges, and of the action of the Board thereon, with such information as it deems proper, and also the statement of the person making the appeal. The ballot shall be canvassed by the Board not less than twenty days after its issue. A majority of the ballots cast will be required to sustain the action of the Board. The Board will notify the person and the Corporate Members of the result of the ballot. In case no appeal be made, the Board of Direction will expel the person, and notify him and the Corporate Members of its action.

10.—A member of any grade in the Society may resign his membership by a written communication to the Secretary, who shall present the same to the Board of Direction; when, if all his dues have been paid, his resignation shall be accepted.

11.—All persons elected and duly qualified, whose address on the records of the Society is within fifty miles of the Post Office in the City of New

York, shall be deemed Resident; and those whose address is beyond that limit shall be deemed Non-Resident.

The classification of each person for the fiscal year as Resident or Non-Resident, shall be determined by the Records of the Society as they may appear on January 1st of that year.

ARTICLE IV.—DUES.

1.—The entrance fees payable on admission to the Society shall be as follows: by Members, thirty dollars; Associate Members, twenty-five dollars; Associates, twenty dollars; Juniors, ten dollars.

2.—The annual dues payable by members, whether Resident or Non-Resident, shall be as follows: by Corporate Members, fifteen dollars; Associates, ten dollars; Juniors, ten dollars.

3.—In addition to the dues prescribed in the preceding section, each Resident Member shall pay annually as follows: Corporate Members, ten dollars; Associates, five dollars; Juniors, five dollars.

4.—A person transferred from any grade to a higher one shall pay the difference between the entrance fees of the two grades, and his annual dues shall be those of the higher grade.

5.—The annual contributions shall become due for the ensuing year on the first day of January, and shall be payable in advance. It shall be the duty of the Secretary to notify each member of the amount due for the ensuing year at the time of giving notice of the Annual Meeting.

6.—Persons elected after six months of any fiscal year shall have expired, shall pay only one-half of the amount of dues for that fiscal year.

7.—All future annual dues may be compounded by a single payment by a Corporate Member of \$250; or by an Associate of \$150. Should a compounding Associate be elected to Corporate Membership he shall pay the further sum of \$100.

Provided, that all compounding Corporate Members or Associates who may be or hereafter become Resident, shall be and remain liable for the annual payment of the difference between the annual dues of Resident and Non-Resident Corporate Members, or Associates; but any Corporate Member may at any time compound for the future payment of all annual dues of every nature and kind by the payment of \$75 in addition to the \$250 hereinbefore named; and any Associate may at any time compound for the future payment of all annual dues as Associate by the payment of \$40 in addition to the \$150 hereinbefore named.

Provided, that any person desiring to compound for future dues shall have paid his entrance fee, all arrears of dues, and the annual dues for the current year, before the compounding sum may be available.

Persons compounding shall sign an agreement that they will be governed by the Constitution and Laws of the Society as they are now formed, or as they may be hereafter altered, amended or enlarged; and that in case of their ceasing to be connected with the Society from any cause whatever, the amount theretofore paid by them for compounding, and for entrance fees and annual dues, shall be the property of the Society.

All moneys thus paid in commutation of annual dues shall be invested as a permanent fund, only the interest thereupon being subject to appropriation for current expenses.

8.—Any person whose dues are more than three months in arrears shall be notified by the Secretary. Should his dues not be paid when they become six months in arrears, he shall lose the right to vote or to receive the publications of the Society. Should his dues become nine months in arrears, he shall again be notified in form prescribed by the Board of Direction, and if such dues become one year in arrears, he shall forfeit his connection with the Society. The Board of Direction, however, may, for cause deemed by it sufficient, extend the time for payment and for the application of these penalties.

9.—The Board of Direction may, for sufficient cause, temporarily excuse from payment of annual dues any member who from ill health, advanced age, or other good reason assigned, is unable to pay such dues; and the Board may remit the whole or part of dues in arrears, or accept in lieu thereof, desirable additions to the Library, or collections.

10.—Every person admitted to the Society shall be considered as belonging thereto and liable for the payment of all dues until he shall have resigned, been expelled, or have been relieved therefrom by the Board of Direction.

11.—Persons elected as Fellows shall become such upon the payment of Two Hundred and Fifty dollars into the permanent funds of the Society. They shall not be liable for other fees and dues.

12.—The status of any present subscribers shall not be changed by the provisions of this Constitution.

ARTICLE V.—OFFICERS.

1.—The officers of the Society shall be a President, four Vice-Presidents, eighteen Directors, a Secretary, and a Treasurer, who, with the five latest living Past-Presidents, who continue to be members, shall constitute the Board of Direction in which the government of the Society shall be vested, and who shall be the Trustees as provided for by the laws under which the Society is organized. For the election of Honorary Members, all the Past-Presidents shall be members of the Board of Direction, except any Past-President who may be disqualified by mental or bodily infirmity, and the evidence of said disqualification shall be a written certificate from his attending physician, or some officer of the Society.

2.—The terms of office of the President, Secretary and Treasurer shall be one year; of the Vice-Presidents, two years; and of the Directors, three years. Provided, however, that at the first election after the adoption of this Constitution, four Vice-Presidents and eighteen Directors shall be elected, of whom two Vice-Presidents and six Directors shall be elected to serve for one year only, and six Directors for two years only; provided, also, that after the first election two Vice-Presidents and six Directors shall be elected each year.

The term of each officer shall begin at the close of the Annual Meeting at which such officer is elected, and shall continue for the period above named or until a successor is duly elected.

3. -A vacancy in the office of President shall be filled by the senior Vice-President.

A vacancy in the office of Vice-President shall be filled by the senior Director. Seniority between persons holding similar offices shall be determined by priority of election to the office, and when these dates are the same, by priority of admission to Corporate Membership; and when the latter dates are identical, the selection shall be made by lot. In case of the disability or neglect in the performance of his duty, of any officer of this Society, the Board of Direction shall have power to declare the office vacant. Vacancies in any office for the unexpired term shall be filled by the Board of Direction, except as provided above.

4.—The President shall be ineligible for re-election. The Vice-Presidents and Directors shall not be eligible for re-election to the same office until at least one full term shall have elapsed after the end of their respective terms.

5.—At least one Vice-President, the Secretary and the Treasurer, and six Directors shall be Resident Corporate Members during their term of office.

ARTICLE VI.—MANAGEMENT.

1.—The President shall have a general supervision of the affairs of the Society. He shall preside at meetings of the Society and of the Board of Direction at which he may be present, and shall be *ex-officio* member of all committees. He shall deliver an address at the Annual Convention.

The Vice-Presidents in order of seniority shall preside at meetings in the absence of the President, and discharge his duties in case of a vacancy in the office.

2.—The Board of Direction shall manage the affairs of the Society in conformity to the laws under which the Society is organized and the provisions of this Constitution. It shall direct the investment and care of the funds of the Society; make appropriations for specific purposes; act upon applications for membership as heretofore provided; take measures to advance the interests of the Society; appoint all its employees; and generally direct its business. The Board of Direction shall make an annual report at the Annual Meeting, transmitting the report of the Treasurer and of other officers, and of Committees.

3.—The Treasurer shall receive all moneys and deposit the same in the name of the Society. He shall invest all funds not needed for current disbursements, as shall be ordered by the Board of Direction. He shall pay all bills, when certified and audited, as provided by this Constitution and by rules to be prescribed by the Board of Direction. He shall make an annual report and such other reports as may be prescribed by the Board of Direction.

The Board of Direction shall secure a satisfactory surety for the faithful performance of his duties by the Treasurer, and shall renew the same during the month of January of each year.

4.—The Secretary shall be a Corporate Member of the Society. He shall be elected annually by the Board of Direction at the meeting to be held within twenty days after the Annual meeting provided for in Section 8 of Article VI, or at an adjournment thereof, and shall hold the office for one year or until his successor is elected, provided that a majority of the whole Board of Direction shall be required to elect the Secretary; this vote to be given, if necessary, by letter.

He shall be, under the direction of the President and Board of Direction, the executive officer of the Society.

He will be expected to attend all meetings of the Society and of the Board of Direction; prepare the business therefor, and duly record the proceedings thereof.

He shall see that all moneys due the Society are carefully collected, and without loss transferred to the custody of the Treasurer.

He shall carefully scrutinize all expenditures, and use his best endeavor to secure economy in the administration of the Society.

He shall personally certify the accuracy of all bills or vouchers on which money is to be paid, and shall countersign the checks drawn by the Treasurer against the funds of the Society, when such drafts are known to him to be proper and duly authorized by the Finance Committee.

He shall have charge of the books of account of the Society, and shall furnish monthly to the Board of Direction a statement of receipts and expenses under their several headings, and also a statement of monthly balances. He shall present annually, to the Board of Direction, a balance sheet of his books, as of the 31st of December, and shall furnish, from time to time, such other statements as may be required of him.

He shall conduct the correspondence of the Society and keep full records of the same.

He shall have charge of the Society's house and its contents; shall supervise the work of all employees of the Society, and see that they diligently perform their respective duties.

He shall perform all other duties which may from time to time be assigned to him by the Board of Direction.

5.—The Board of Direction may also, if they deem it necessary, appoint an Assistant Secretary, who shall aid the Secretary and be under his immediate direction in all matters. His whole time shall be given to the Society.

6.—The Secretary and Treasurer shall be paid salaries to be determined by the Board of Direction; but such salaries shall not be reduced during the term of office, as provided in this Constitution. All other salaries shall be fixed, from time to time, by the Board of Direction.

7.—The Board of Direction shall meet within twenty days after the Annual Meeting, and shall then appoint from its members a Finance Committee of five, a Library Committee of five, and a Committee on Publications of five. At least three members of the Finance Committee, and two members of the other Committees, shall be resident within fifty miles of New York.

These Committees shall report to the Board of Direction, and perform their duties under its supervision.

8.—The Finance Committee shall have immediate supervision of the financial affairs of the Society; shall employ an expert accountant to audit the accounts monthly; shall approve all bills before payment, and shall make recommendations to the Board of Direction as to the investment of moneys, and as to other financial matters.

9.—The Library Committee shall have general supervision of the Library and the House of the Society and the property therein; shall make recommendations to the Board with reference thereto, and shall direct the expenditure for books and other articles of permanent value, of such sums as may be appropriated for these purposes.

10.—The Committee on Publications shall have general supervision of the publications of the Society, and of contracts and expenditures connected therewith.

11.—In the consideration of papers offered for presentation, those papers containing matter readily found elsewhere, those specially advocating personal interests, those carelessly prepared or controverting established facts, and those purely speculative or foreign to the purposes of the Society, shall be rejected. The Committee on Publications shall determine which papers shall be read in full, and which shall be printed after reading by title only. The Committee may return a paper to the writer for correction and emendation, and call to its aid one or more members of special experience relating to the subject treated, either to advise on the paper or to discuss it. Such papers as in the judgment of the Committee should appear in the *Transactions*, shall promptly, upon their acceptance, be printed and distributed to members of all grades; others shall, with the consent of the authors, be suitably indexed, and filed for reference, or the Committee may provide abstracts thereof, which, when approved by the authors, may be published instead of the original papers. Advance copies of papers and discussions may be sent out to the membership before final publication.

12.—Special committees to report upon engineering subjects shall be authorized only by a majority of the votes cast by the Society, and in the following manner: A proposition to appoint such a Committee shall be presented at a regular meeting of the Society, and if sustained, on a motion to refer the same to the Board of Direction, by an affirmative vote of not less than twenty-five Corporate Members, it shall be so referred.

The Board of Direction shall then consider the same and report its recommendations to the Society at the next general business meeting, together with a statement of the arguments for and against the appointment of such Committee.

If a motion for the issue of a letter-ballot thereon receive the affirmative vote of two-thirds of the Corporate Members present, the Board of Direction shall, within thirty days thereafter, issue the letter-ballot, accompanied by a statement of the arguments for and against the proposition.

A majority of a total vote of not less than one-third of the Corporate Membership of the Society shall be necessary for its adoption, whereupon the Committee so authorized shall be appointed by the Board of Direction.

ARTICLE VII.—NOMINATION AND ELECTION OF OFFICERS.

1.—The Board of Direction shall, from time to time, divide the territory occupied by the membership into seven geographical districts, to be designated by numbers. District No. 1 shall be the territory within fifty miles of the Post Office in the City of New York. Each of the other six districts shall be, as nearly as practicable, contiguous territory; each shall contain, as nearly as practicable, an equal number of members, and they shall be designated as Districts Nos. 2, 3, 4, 5, 6 and 7. The Board shall announce such division to the Society on or before the first day of May in each year.

2.—At the Annual Meeting of each year, seven Corporate Members, not officers of the Society, one from each of the geographical districts, shall be appointed by the meeting to serve for two years; who, with the five living last

Past-Presidents of the Society, shall be a committee to nominate officers for the Society.

The Board of Direction may prescribe the mode of procedure for appointing this Committee.

The Committee so appointed shall meet at the Annual Convention of the Society, and nominate candidates to fill the offices, named in Article V, so as to provide, with the officers holding over, a Vice-President and six Directors residing in District No. 1, and twelve Directors divided equally, with regard to number and residence, among the remaining districts, Nos. 2, 3, 4, 5, 6 and 7.

A list of nominees for the offices to be filled at the next Annual Election shall be presented by the Committee to the Board of Direction within ten days after the nominees have been selected.

3.—Directly after the first of October the aforesaid list of nominees shall be mailed to every Corporate Member whose address is known, provided that if any person shall be found by the Board of Direction to be ineligible for the office for which he is nominated, or should a nominee decline such nomination, his name shall not be sent out, but the Board shall substitute another name therefor. The Board shall also fill any vacancies that may occur in this list of nominees up to the time the ballots are sent out. Vacancies must be so filled as to preserve the geographical distribution of officers prescribed in Section 2 of this article.

4.—At any time before the first day of December, any ten or more Corporate Members may send to the Secretary additional nominations, signed by such members; but nominations so made must comply with Section 2 of this article, regarding the distribution of nominees among the several districts.

5.—At least thirty days before the Annual Meeting, there shall be mailed to every Corporate Member whose address is known a letter-ballot with envelopes for voting. This ballot shall include all the nominations made in accordance with this article. The names and residencees of the nominees, their grades of membership, and, in the case of nominees for Directors, the number of the district in which they reside, shall be given. The names of the nominees for any one office shall be arranged alphabetically without distinguishing marks of any kind other than the designations named herein.

Voters may erase names from the printed ballot-list and may substitute the name or names of any other person or persons eligible for any office. But the number of names for each office on the ballot voted must not exceed the number to be elected at that time to such office, and the vote must be for the proper number of officers resident in each of the seven districts. Ballots not complying with these provisions shall be rejected.

Directions in accordance with these provisions shall be issued with the ballots.

6.—Ballots may be sent by mail to the Secretary, or may be presented to him at the Society House. They must be enclosed in two sealed envelopes, and the outer envelope shall be endorsed by the voter's signature.

The Secretary shall make from the signatures on the outer envelopes a list of the voters from whom ballots are received, which list shall be open to inspection by all Corporate Members. A voter may withdraw his ballot, and may substitute another, at any time before the polls close.

7.—The polls shall be closed at 12 o'clock noon on the first day of the Annual Meeting, and the ballots shall be canvassed publicly by tellers, who shall be appointed by the presiding officer.

The persons of each district who shall receive the highest number of votes for the office for which they are candidates shall be declared elected.

In case of a tie between two or more candidates for the same office, the Annual Meeting shall elect the officer from among the candidates so tied.

The presiding officer shall announce to the meeting the names of the officers elected, in accordance with this section.

ARTICLE VIII.—MEETINGS.

1.—A Convention of the Society for the reading and discussion of professional papers and for social intercourse shall be held annually at such time and place as the Society may determine.

2.—There shall be two general Business Meetings of the Society each year; the Annual Meeting, which shall be held at the offices of the Society on the third Wednesday in January, and at which the annual reports for the year ending December 31st previous shall be presented, and the ballot for officers canvassed; and a Business Meeting during the Annual Convention, which shall be held at a time and place to be determined by the Board of Direction.

At these meetings thirty Corporate Members shall constitute a quorum.

3.—Business Meetings shall be held monthly on the first Wednesday of each month, except during the months of July and August. At these meetings thirty Corporate Members shall constitute a quorum.

4.—In addition to the Annual Meeting and the Annual Convention, meetings for the reading and discussion of papers shall be held as ordered by the Board of Direction.

5.—Special meetings may be called by the Board of Direction, and shall be so called on the request of thirty Corporate Members, which request shall state the purpose of such meeting. The call for such meetings shall be issued ten days in advance, and shall state the purpose thereof, and no other business shall be taken up at such meeting. At these meetings thirty Corporate Members shall constitute a quorum.

6.—The Society may adopt, from time to time, rules for the order of business at its meetings.

7.—Meetings of the Board of Direction shall be held at the time of the Annual Meeting and of the Annual Convention, at which meeting nine members shall constitute a quorum; and at such other times as the Board may determine, at which five members shall constitute a quorum.

ARTICLE IX.—AMENDMENTS.

1.—Proposed amendments to this Constitution must be reduced to writing and signed by not less than five Corporate Members, and be submitted and acted upon as follows:

2.—Amendments presented to the Secretary on or before the first Wednesday in November shall be sent by letter to the several Corporate Members of the Society at least twenty-five days previous to the Annual Meeting. Such amendments shall be in order for discussion at such Annual Meeting, and may be

amended in any manner pertinent to the original amendments by a majority vote of the Annual Meeting, and if so amended shall be voted upon by letter-ballot in form as amended by the Annual Meeting; if not so amended, they shall be voted upon by letter-ballot as submitted. The vote to be counted at the first regular meeting in March.

3.—Amendments presented to the Secretary not less than sixty days previous to the date of the Annual Convention shall be sent by letter to the several Corporate Members of the Society at least twenty-five days previous to the Annual Convention. Said amendments shall be in order for discussion at the Business Meeting during such Annual Convention, and may be amended in any manner pertinent to the original amendments by a majority vote of the Business Meeting during the Annual Convention, and, if so amended, shall be voted upon by letter-ballot in form as amended by said Business Meeting; if not so amended, they shall be voted upon by letter-ballot as submitted. The vote to be counted at the first regular meeting in October.

4.—If, after discussion of a proposed amendment, at either of the general meetings of the Society, the meeting shall so decide by a majority vote, it may refer the amendment to a Committee for further consideration, which Committee shall report at the next general meeting, whereupon the amendment shall be voted upon as hereinbefore provided.

5.—An affirmative vote of two-thirds of all ballots cast shall be necessary to the adoption of any amendment.

Amendments so adopted shall take effect thirty days after their adoption, provided that the officers of the Society, at the time any amendment may be adopted, shall continue in office until the next Annual Election.

GENERAL INFORMATION.

MEETINGS.—Regular meetings are held at the House of the Society, No. 220 West Fifty-seventh Street, New York, on the first and third Wednesdays of each month, at 8.30 p. m., except during the summer. The Annual Meeting is held on the third Wednesday in January. A Convention is held annually, at a time and place determined each year by the Society.

The House and Library of the Society are open from 9 a. m. to 10 p. m. every day, except Sundays, Fourth of July, Thanksgiving Day and Christmas Day.

PUBLICATIONS.—The Society issues two publications, *Proceedings* and *Transactions*, which are furnished without extra charge to members of every grade. Subscription price per annum is for *Proceedings*, \$6; for *Transactions*, \$10. Discount to libraries, book dealers, etc., 25 per cent.

Ten numbers of *Proceedings* are issued during the year, the numbers appearing on the fourth Wednesday of each month except June and July. Each number contains minutes of meetings, announcements of matters of current interest, a classified list of current engineering articles, and a list of new books received in the Library. Papers to be subsequently presented, as well as discussions to which they give rise, are also published in *Proceedings*.

The papers with complete discussions are subsequently republished in the volumes of *Transactions*, which for some years have been issued semi-annually. Each volume contains about 600 pages, and is bound in paper covers; arrangements have also been made for furnishing these volumes bound in standard cloth (50 cents), or half morocco (\$1.00), to members or subscribers who desire to pay for them in that form.

PROFESSIONAL PAPERS.—Papers and discussions on subjects of engineering interest are invited by the Board of Direction from all persons, whether members of the Society or not, subject to proper editorial supervision. Under the Constitution, matter which may be readily found elsewhere, advocates personal interests, is carelessly prepared, controverts established facts, or is purely speculative or foreign to the purposes of the Society, must be excluded.

All papers, on their acceptance by the Committee on Publications, become the property of the Society.

ADDITIONS TO LIBRARY.—It is desirable that copies of books on engineering subjects, and of reports of municipal, railway, canal, water supply and all other public works, be added to the Library. Members of the Society and all who feel an interest in the proper maintenance of a technical reference library, are asked to donate engineering books or reports.

ADMISSION TO MEMBERSHIP.—The requirements for each of the grades of membership may be found on pages 5 and 6.

For blank forms and other information, address the Secretary, at the Society House.

FEES AND DUES.	RESIDENT.				NON-RESIDENT.			
	Members.	Associate Members.	Associates.	Juniors.	Members.	Associate Members.	Associates.	Juniors.
Entrance Fee	\$30.00	\$25.00	\$20.00	\$10.00	\$30.00	\$25.00	\$20.00	\$10.00
Yearly Assessment	25.00	25.00	15.00	15.00	15.00	15.00	10.00	10.00
Total, payable upon Election	\$55.00	\$50.00	\$35.00	\$25.00	\$45.00	\$40.00	\$30.00	\$20.00

Fellowship fee, \$250 in one payment for life.

Annual dues are payable in advance on the 1st day of January.

Members elected during the last half of the year pay only one-half of the amount of dues for that year.

COMPOUNDING DUES.—The annual dues of a Corporate Member may be compounded by a single payment of \$250; of an Associate by a payment of \$150. Should a compounding Associate be elected to Corporate Membership, an additional payment of \$100 is necessary.

All compounding Corporate Members or Associates, who may be or hereafter become Resident, remain liable for the annual payment of the difference between the annual dues of Resident and Non-Resident Corporate Members or Associates; but any Corporate Member may at any time compound for the future payment of all annual dues of every nature and kind by the payment of \$75 in addition to the \$250 hereinbefore named; and any Associate may at any time compound for the future payment of all annual dues as Associate by the payment of \$40 in addition to the \$150 hereinbefore named.

Any person compounding his dues must have paid his entrance fee, all arrears of dues, and the annual dues for the current year, before the compounding sum can be accepted.

Persons compounding shall sign an agreement that they will be governed by the Constitution and Laws of the Society as they are now formed, or as they may be hereafter altered, amended or enlarged; and that in case of their ceasing to be connected with the Society from any cause whatever, the amount theretofore paid by them for compounding, and for entrance fees and annual dues, shall be the property of the Society.

CERTIFICATES OF MEMBERSHIP.—The prices, to cover cost of Certificates, are as follows:

Parchment.....	\$2.25
Parchment Paper.....	1.25
Plate Paper.....	1.25

BADGE.—This is of gold and enameled, with the member's name and membership number engraved on the back, and is mounted either as an ordinary pin, a scarf pin, a watch charm, or a button. The price is \$6 for either of the first three or \$6.50 for the button. Badges can be secured only upon application to the Secretary.

REMITTANCES.—All remittances should be made payable to the order of the American Society of Civil Engineers. They should be in drafts on New York, in Postal Money Orders payable at the New York Post-Office (not at a branch office), or Express Money Orders.

**THE SEVEN GEOGRAPHICAL DISTRICTS INTO WHICH THE
TERRITORY OCCUPIED BY THE MEMBERSHIP IS
DIVIDED, UNDER ART. VII, SEC. I,
OF THE CONSTITUTION.**

District No. 1.—The territory within 50 miles of the Post Office in the City of New York.

District No. 2.—The States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut (except as included in District No. 1), and all countries in Europe.

District No. 3.—The States of New York and New Jersey (except as included in District No. 1), and the Dominion of Canada.

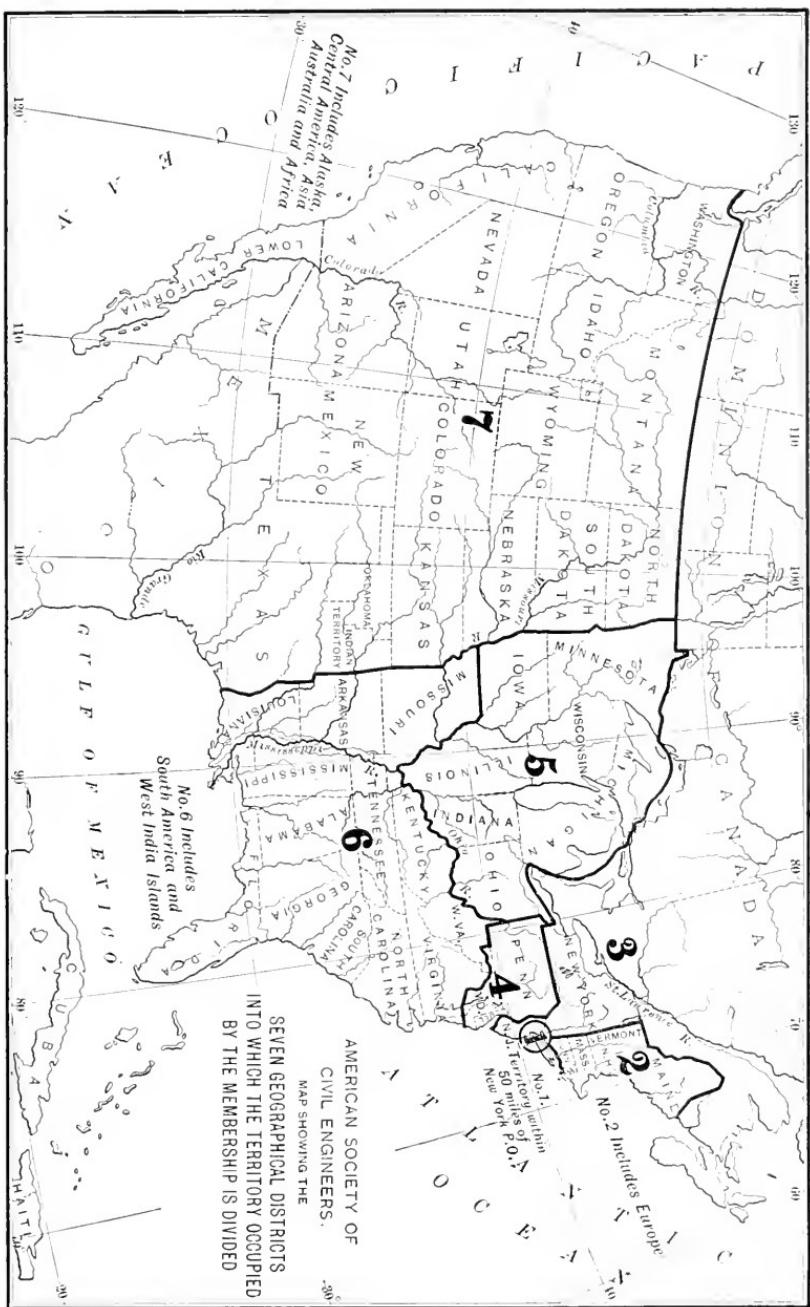
District No. 4.—The States of Pennsylvania, Delaware and Maryland and the District of Columbia.

District No. 5.—The States of Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa and Minnesota.

District No. 6.—The States of Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Missouri, Arkansas and Louisiana, the West India Islands, and all countries in South America.

District No. 7.—The States of North Dakota, South Dakota, Nebraska, Kansas, Texas, Montana, Wyoming, Colorado, Idaho, Utah, Washington, Oregon, California and Nevada; the following territories: Indian Territory, Oklahoma, New Mexico, Arizona and Alaska; the Republic of Mexico, and all countries in Central America, Asia, Australasia and Africa.

These Districts are shown on the map on the opposite page.



RULES GOVERNING THE AWARD OF THE NORMAN MEDAL, THE THOMAS FITCH ROWLAND PRIZE AND THE COLLINGWOOD PRIZE.

PRIZES.

There are at present three endowed prizes for papers published in the *Transactions* of the American Society of Civil Engineers. These prizes are awarded annually.

With the assent and the approval of the donors, by action of the Board of Direction, June 1st, 1897, the Society assumes the responsibility for the payment in perpetuity of the Norman Medal, Thomas Fitch Rowland Prize and Collingwood Prize.

COMMITTEE ON PRIZES.

1. The Board of Direction shall appoint annually, not later than its regular meeting in June of each year, three Corporate Members of the Society, not members of the Board of Direction, who shall form a Committee to recommend the award of all prizes during the year.
2. The papers considered shall include all papers published in the *Transactions* during the year ending with the month of July.
3. The Committee on Prizes shall report its recommendation to the Board of Direction on or before December 31st, and the awards shall be made by the Board of Direction.
4. The announcement of the awards shall be made at the Annual Meeting.
5. The Secretary of the Society shall act as Secretary to the Committee on Prizes, but shall have no vote or voice in its deliberations.

CODE OF RULES.

The Norman Medal.—The Norman Medal was instituted and endowed in 1874 by the late George H. Norman, M. Am. Soc. C. E.

I. Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to members of the Society.

II. There shall be one gold medal awarded as hereinafter provided. The dies therefor shall be deposited with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a value of \$60.

III. All original papers presented to the Society by members of any class, and published in the *Transactions* during the year for which the medal is awarded, shall be open to the award, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been published in the *Transactions* in any previous year.

IV. The medal shall be awarded to a paper which shall be judged worthy of special commendation for its merit as a contribution to engineering science.

The Thomas Fitch Rowland Prize.—The Thomas Fitch Rowland Prize was originally instituted by the Society at the Annual Meeting of 1882. It was

endowed in 1884 by Thomas Fitch Rowland, Hon. M. Am. Soc. C. E. Its award is not restricted to members of the Society.

I. The prize shall consist of \$60 in cash, with an engraved certificate signed by the President and Secretary of the Society.

II. In the award of this prize preference shall be given to papers describing in detail accomplished works of construction, their cost and errors in design and execution.

The Collingwood Prize for Juniors.—The Collingwood Prize for Juniors was instituted and endowed in 1894 by Francis Collingwood, M. Am. Soc. C. E.

I. The competition for the prize shall be restricted to the Juniors of the Society.

II. The prize shall consist of \$50 in cash, with an engraved certificate, signed by the President and the Secretary of the Society.

III. The prize shall be awarded to a paper describing an engineering work with which the writer has been directly connected, or it shall record investigations contributing to engineering knowledge, some essential part of which was made by the writer, and contain a rational digest of results. Any mathematical treatment must show immediate adaptability to professional practice. Accuracy of language and excellence of style will be factors in the award.

IV. These rules may be modified by the Board of Direction.

The awards of the Norman Medal, the Thomas Fitch Rowland Prize, and the Collingwood Prize are indicated in the List of Members by the letters N., R. and C., respectively, prefixed to the name of each recipient.

AWARDS OF THE NORMAN MEDAL.

1874. J. JAMES R. CROES, for paper "Memoir of the Construction of a Masonry Dam." Vol. III,* p. 337.
1875. THEODORE G. ELLIS, for paper "Description and Results of Hydraulic Experiments with Large Apertures, at Holyoke, Mass., in 1874." Vol. V,* p. 19.
1877. WILLIAM W. MACLAY, for paper "Notes and Experiments on the Use and Testing of Portland Cement." Vol. VI,* p. 311.
Book Prize awarded to JULIUS H. STRIEDINGER, for paper "On Igniting Blasts by Means of Electricity." Vol. VII,* p. 1.
1879. EDWARD P. NORTH, for paper "The Construction and Maintenance of Roads." Vol. VIII,* p. 95.
Book Prize awarded to MAX E. SCHMIDT, for paper "Notes on the South Pass Jetties." Vol. VIII,* p. 189.
1880. THEODORE COOPER, for paper "The Use of Steel for Bridges." Vol. VIII,* p. 263.
1881. L. L. BUCK, for paper "The Re-Enforcement of the Anchorage and Renewal of the Suspended Superstructure of the Niagara Railroad Suspension Bridge." Vol. X,* p. 195.
1882. A. FTELEY and F. P. STEARNS, for paper "Description of Some Experiments on the Flow of Water Made during the Construction of Works for Conveying the Water of Sudbury River to Boston." Vol. XII,* p. 1.
1883. WILLIAM P. SHINN, for papers "On the Increased Efficiency of Railways for the Transportation of Freight." Vol. XI,* p. 365; and "How can Railways be made more Efficient in the Transportation of Freight?" Vol. XII,* p. 189.
1884. JAMES CHRISTIE, for paper "Experiments on the Strength of Wrought-Iron Struts." Vol. XIII,* p. 85.
1885. ELIOT C. CLARKE, for paper "Record of Tests of Cement Made for Boston Main Drainage Works." Vol. XIV,* p. 141.
1886. EDWARD BATES DORSEY, for paper "English and American Railroads Compared." Vol. XV,* p. 1.
1887. DESMOND FITZGERALD, for paper "Evaporation." Vol. XV,* p. 581.
1888. E. E. RUSSELL TRATMAN, for paper "English Railroad Track." Vol. XVIII,* p. 217.
1889. THEODORE COOPER, for paper "American Railroad Bridges." Vol. XXI,* p. 1.
1890. JOHN R. FREEMAN, for paper "Experiments Relating to the Hydraulics of Fire Streams." Vol. XXI,* p. 303.
1891. JOHN R. FREEMAN, for paper "The Nozzle as an Accurate Water Meter." Vol. XXIV,* p. 492.
1892. WILLIAM STARLING, for paper "Some Notes on the Holland Dikes." Vol. XXVI,* p. 559.
1893. DESMOND FITZGERALD, for paper "Rainfall, Flow of Streams, and Storage." Vol. XXVII,* p. 253.
1894. ALFRED E. HUNT, for paper "A Proposed Method of Testing Structural Steel." Vol. XXX,* p. 181.
1895. WILLIAM HAM. HALL, for paper "The Santa Ana Canal of the Bear Valley Irrigation Company." Vol. XXXIII,* p. 61.
1896. JOHN E. GREINER, for paper "What is the Life of an Iron Railroad Bridge?" Vol. XXXIV,* p. 294.
1897. JULIUS BAIER, for paper "Wind Pressures in the St. Louis Tornado, with Special Reference to the Necessity of Wind Bracing for High Buildings." Vol. XXXVII,* p. 221.
1898. B. F. THOMAS, for paper "Movable Dams." Vol. XXXIX,* p. 431.
1899. E. HERBERT STONE, for paper "The Determination of the Safe Working Stress for Railway Bridges of Wrought Iron and Steel." Vol. XLI,* p. 467.
1900. JAMES A. SEDDON, for paper "River Hydraulics." Vol. XLIII,* p. 179.

* *Transactions*, Am. Soc. C. E.

AWARDS OF THE THOMAS FITCH ROWLAND PRIZE.*

1883. G. LINDENTHAL, for paper "Rebuilding the Monongahela Bridge, at Pittsburgh, Pa." Vol. XII, † p. 353.
1884. HAMILTON SMITH, JR., for paper "Water Power with High Pressures and Wrought-Iron Water Pipe." Vol. XIII, † p. 15.
1885. A. M. WELLINGTON, for paper "Experiments with New Apparatus on Journal Friction at Low Velocities." Vol. XIII, † p. 409.
1886. CHARLES C. SCHNEIDER, for paper "The Cantilever Bridge at Niagara Falls." Vol. XIV, † p. 499.
1887. WILLIAM METCALF, for paper "Steel: Its Properties; Its Use in Structures and in Heavy GUNS." Vol. XVI, † p. 283.
1888. CLEMENS HERSCHEL, for paper "The Venturi Water Meter: An Instrument Making Use of a New Method of Gauging Water; Applicable to the Cases of Very Large Tubes, and of a Small Value Only, of the Liquid to be Gauged." Vol. XVII, † p. 228.
1889. JAMES D. SCHUYLER, for paper "The Construction of the Sweetwater Dam." Vol. XIX, † p. 201.
1890. O. CHANUTE, JOHN F. WALLACE and WILLIAM H. BREITHAUPt, for paper "The Sibley Bridge." Vol. XXI, † p. 97.
1891. WILLIAM H. BURR, for paper "The River Spans of the Cincinnati and Covington Elevated Railway, Transfer and Bridge Company." Vol. XXIII, † p. 47.
1892. SAMUEL M. ROWE, STILLMAN W. ROBINSON and HENRY H. QUIMBY, for paper "Red Rock Cantilever Bridge." Vol. XXV, † p. 662.
1893. WILLIAM MURRAY BLACK, for paper "The Improvement of Harbors on the South Atlantic Coast of the United States." Vol. XXIX, † p. 223.
1894. DAVID L. BARNES, for paper "Distinctive Features and Advantages of American Locomotive Practice." Vol. XXIX, † p. 385.
1895. WILLIAM R. HILL, for paper "The Water-Works of Syracuse, N. Y." Vol. XXXIV, † p. 23.
1896. H. ST. L. COPPÉE, for paper "Bank Revetment on the Lower Mississippi." Vol. XXXV, † p. 141.
1897. ARTHUR L. ADAMS, for paper "The Astoria (Oregon) City Water-Works." Vol. XXXVI, † p. 1.
1898. HENRY GOLDFMARK, for paper "The Power Plant, Pipe Line and Dam of the Pioneer Electric Power Company at Ogden, Utah." Vol. XXXVIII, † p. 246.
1899. R. S. BUCK, for paper "The Niagara Railway Arch." Vol. XL, † p. 125.
1900. ALLEN HAZEN, for paper "The Albany Water Filtration Plant." Vol. XLIII, † p. 244.
1901. L. G. MONTONY, for paper "The Ninety-Sixth Street Power Station of the Metropolitan Street Railway Company, of New York City." Vol. XLIV, † p. 119.

AWARDS OF THE COLLINGWOOD PRIZE.

1895. MORTON L. BYERS, for paper "The Renewal of the Channel Pier of the Cincinnati and Muskingum Valley Railway Bridge over the Scioto River." Vol. XXXI, † p. 361.
1896. HERBERT WALDO YORK, for paper "The Twenty-Eighth Street Central Station of the United Electric Light and Power Company." Vol. XXXV, † p. 429.
1899. JULIUS KAHN, for paper "The Coal Hoists of the Calumet and Hecla Mining Company." Vol. XLI, † p. 269.
1900. ROBERT P. WOODS, for paper "Street Grades and Cross-Sections in Asphalt and Cement." Vol. XLII, † p. 1.
1901. F. A. KUMMER, for paper "A Proposed Method for the Preservation of Timber." Vol. XLV, † p. 181.

* This prize was known as the Rowland Prize from 1883 to 1896 and consisted of \$50. Beginning with the award for 1897 it is to be known as the Thomas Fitch Rowland Prize and consists of \$60, with an engraved certificate signed by the President and Secretary of the Society.

† *Transactions, Am. Soc. C. E.*

LOCATION AND DATE OF ANNUAL CONVENTIONS.

Number.	Location.	Date.
<i>First,</i>	New York, N. Y.,	June, 1869
<i>Second,</i>	New York, N. Y.,	June, 1870
<i>Third,</i>	New York, N. Y.,	June, 1871
<i>Fourth,</i>	Chicago, Ill.,	June, 1872
<i>Fifth,</i>	Louisville, Ky.,	May, 1873
<i>Sixth,</i>	New York, N. Y.,	June, 1874
<i>Seventh,</i>	Pittsburg, Pa.,	June, 1875
<i>Eighth,</i>	Philadelphia, Pa.,	June, 1876
<i>Ninth,</i>	New Orleans, La.,	April, 1877
<i>Tenth,</i>	Boston, Mass.,	June, 1878
<i>Eleventh,</i>	Cleveland, Ohio,	June, 1879
<i>Twelfth,</i>	St. Louis, Mo.,	May, 1880
<i>Thirteenth,</i>	Montreal, Que., Canada,	June, 1881
<i>Fourteenth,</i>	Washington, D. C.,	May, 1882
<i>Fifteenth,</i>	St. Paul and Minneapolis, Minn.,	June, 1883
<i>Sixteenth,</i>	Buffalo, N. Y.,	June, 1884
<i>Seventeenth,</i>	Deer Park, Md.,	June, 1885
<i>Eighteenth,</i>	Denver, Colo.,	July, 1886
<i>Nineteenth,</i>	Hotel Kaaterskill, N. Y.,	July, 1887
<i>Twenty-tenth,</i>	Milwaukee, Wis.,	June, 1888
<i>Twenty-first,</i>	Seabright, N. J.,	June, 1889
<i>Twenty-second,</i>	Cresson, Pa.,	June, 1890
<i>Twenty-third,</i>	Lookout Mountain, Tenn.,	May, 1891
<i>Twenty-fourth,</i>	Old Point Comfort, Va.,	June, 1892
<i>Twenty-fifth,</i>	Chicago, Ill.,	July, 1893
<i>Twenty-sixth,</i>	Niagara Falls, N. Y.,	June, 1894
<i>Twenty-seventh,</i>	Hotel Pemberton, Hull, Mass.,	June, 1895
<i>Twenty-eighth,</i>	San Francisco, Cal.,	June, 1896
<i>Twenty-ninth,</i>	Quebec, Que., Canada,	June, 1897
<i>Thirtieth,</i>	Detroit, Mich.,	July, 1898
<i>Thirty-first,</i>	Cape May, N. J.,	June, 1899
<i>Thirty-second,</i>	London, England,	July, 1900
<i>Thirty-third,</i>	Niagara Falls, N. Y..	June, 1901

LIST OF MEMBERS.

AUTHORIZED ABBREVIATIONS.

HONORARY MEMBER,	=	=	Hon. M. Am. Soc. C. E.
MEMBER,	=	=	M. Am. Soc. C. E.
ASSOCIATE MEMBER,	=	=	Assoc. M. Am. Soc. C. E.
ASSOCIATE,	=	=	Assoc. Am. Soc. C. E.
JUNIOR,	=	=	Jun. Am. Soc. C. E.
FELLOW,	=	=	F. Am. Soc. C. E.

The Board of Direction requests the use of these
abbreviations in all cases.

The awards of the Norman Medal, the Thomas Fitch Rowland Prize
and the Collingwood Prize are indicated in this list by the letters N., R.
and C., respectively, prefixed to the name of each recipient.

PAST-PRESIDENTS.

JAMES LAURIE*	Nov. 5, 1852, to Nov. 6, 1867.
JAMES PUGH KIRKWOOD*	Nov. 6, 1867, to Aug. 5, 1868.
WILLIAM JARVIS McALPINE*	Aug. 5, 1868, to Nov. 3, 1869.
ALFRED WINGATE CRAVEN*	Nov. 3, 1869, to Nov. 1, 1871.
HORATIO ALLEN*	Nov. 1, 1871, to Nov. 5, 1873.
JULIUS WALKER ADAMS*	Nov. 5, 1873, to Nov. 3, 1875.
GEORGE SEARS GREENE*	Nov. 3, 1875, to Nov. 7, 1877.
ELLIS SYLVESTER CHESBROUGH*	Nov. 7, 1877, to Nov. 6, 1878.
WILLIAM MILNOR ROBERTS*	Nov. 6, 1878, to Nov. 5, 1879.
ALBERT FINK*	Nov. 5, 1879, to Nov. 3, 1880.
JAMES BICHENO FRANCIS*	Nov. 3, 1880, to Jan. 18, 1882.
ASHBEL WELCH†	Jan. 18, 1882, to Sept. 25, 1882.
CHARLES PAINE	Jan. 17, 1883, to Jan. 16, 1884.
DON JUAN WHITTEMORE	Jan. 16, 1884, to Jan. 21, 1885.
FREDERIC GRAFF*	Jan. 21, 1885, to Jan. 20, 1886.
HENRY FLAD*	Jan. 20, 1886, to Jan. 19, 1887.
WILLIAM EZRA WORTHEN*	Jan. 19, 1887, to Jan. 18, 1888.
THOMAS COLTRIN KEEFER	Jan. 18, 1888, to Jan. 16, 1889.
MAX JOSEPH BECKER*	Jan. 16, 1889, to Jan. 15, 1890.
WILLIAM POWELL SHINN*	Jan. 15, 1890, to Jan. 21, 1891.
OCTAWE CHANUTE	Jan. 21, 1891, to Jan. 20, 1892.
MENDES COHEN	Jan. 20, 1892, to Jan. 18, 1893.
WILLIAM METCALF	Jan. 18, 1893, to Jan. 17, 1894.
WILLIAM PRICE CRAIGHILL	Jan. 17, 1894, to Jan. 16, 1895.
GEORGE SHATTUCK MORISON	Jan. 16, 1895, to Jan. 15, 1896.
THOMAS CURTIS CLARKE*	Jan. 15, 1896, to Jan. 20, 1897.
BENJAMIN MORGAN HARROD	Jan. 20, 1897, to Jan. 19, 1898.
ALPHONSE FTELEY	Jan. 19, 1898, to Jan. 18, 1899.
DESMOND FITZGERALD	Jan. 18, 1899, to Jan. 17, 1900.
JOHN FINDLEY WALLACE	Jan. 17, 1900, to Jan. 16, 1901.
JOHN JAMES ROBERTSON CROES	Jan. 16, 1901, to Jan. 15, 1902.

* Deceased.

† Mr. Ashbel Welch died, September 25, 1882, during his term of office as President.

OFFICERS, 1902.

President, ROBERT MOORE.

Vice-Presidents for one year—Term expires January, 1903:

HENRY S. HAINES, GEORGE H. BENZENBERG.

Vice-Presidents for two years—Term expires January, 1904:

CHARLES C. SCHNEIDER, JOHN R. FREEMAN.

Secretary, CHARLES WARREN HUNT.

Treasurer, JOSEPH M. KNAP.

DIRECTORS:

Term expires January, 1903:

JOHN F. O'ROURKE, HENRY B. SEAMAN, THOMAS H. JOHNSON, JOSEPH RAMSEY, JR.,
HENRY B. RICHARDSON, WILLIAM H. KENNEDY.

Term expires January, 1904:

JOSIAH A. BRIGGS, GEORGE F. SWAIN, EMIL KUICHLING, MORDECAI T. ENDICOTT,
EDWARD C. CARTER, FRANK C. OSBORN.

Term expires January, 1905:

RICHARD S. BUCK, GEORGE H. PEGRAM, WILLIAM J. WILGUS, WILLIAM JACKSON,
EDMUND F. VAN HOESEN, JAMES L. FRAZIER.

Past-Presidents, Members of the Board:

BENJAMIN M. HARROD, ALPHONSE FTELEY, DESMOND FITZGERALD,
JOHN F. WALLACE, J. JAMES R. CROES.

Assistant Secretary, THOMAS J. McMINN.

Standing Committees of the Board of Direction.

On Finance:

JOSIAH A. BRIGGS,	GEORGE F. SWAIN,
GEORGE H. BENZENBERG,	WILLIAM J. WILGUS.
RICHARD S. BUCK,	

On Publications:

JOHN F. O'ROURKE,	THOMAS H. JOHNSON,
GEORGE H. PEGRAM,	FRANK C. OSBORN.
JOSEPH RAMSEY, JR.,	

On Library:

HENRY S. HAINES,	MORDECAI T. ENDICOTT,
CHARLES C. SCHNEIDER,	CHARLES WARREN HUNT.
EMIL KUICHLING.	

Special Committees.

On Analysis of Iron and Steel:

Sub-Committee of the American Society of Civil Engineers (of the International Committee on Standards for the Analysis of Iron and Steel, of which Professor J. W. Langley is Chairman).

CHARLES B. DUDLEY,	WILLIAM METCALF,	THOMAS RODD.
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On Units of Measurement:

GEORGE M. BOND,	CHARLES B. DUDLEY,
WILLIAM M. BLACK,	A. C. HUMPHREYS.
R. E. McMATH,	

On Uniform Tests of Cement:

GEORGE F. SWAIN,	LOUIS C. SABIN,
ALFRED NOBLE,	CLIFFORD RICHARDSON,
GEORGE S. WEBSTER,	F. H. LEWIS,
S. B. NEWBERRY,	RICHARD L. HUMPHREY.
W. B. W. HOWE,	

LIST OF MEMBERS.

HONORARY MEMBERS.

[Hon. M. Am. Soc. C. E.]

		Date of Membership.
BAKER, Sir BENJAMIN		
2 Queen Square Pl., Queen Anne's Mansions, Westminster, S. W., London, England.....		May 5, 1897
CRAIGHILL, WILLIAM PRICE (<i>Past-President</i>)		
Retired Chief of Engrs. and Brig.-Gen., U. S. A. { M. Charlestown, Jefferson Co., W. Va..... { Hon. M.	Oct. 7, 1885 Mar. 23, 1896	
DAVIDSON, GEORGE		
Prof. of Geography, Univ. of California, San Francisco, Cal...		May 5, 1897
Fox, Sir DOUGLAS	{ Cor. M.	June 7, 1871
28 Victoria St., Westminster, London, England.... { Hon. M.		Mar. 5, 1901
FRITZ, JOHN	{ M.	July 5, 1893
Bethlehem, Pa..... { Hon. M.		Sept. 5, 1899
GRAY, GEORGE EDWARD	{ M.	June 2, 1873
Cons. Engr., 1115 Bush St., San Francisco, Cal.... { Hon. M.		June 5, 1894
MELVILLE, GEORGE WALLACE		
Engr.-in-Chief, U. S. N., Navy Dept., Washington, D. C.....		Dec. 20, 1899
ROWLAND, THOMAS FITCH		
Pres., The Continental Iron Works, Brooklyn, N. Y. { M. (Res., 329 Madison Ave., New York City)..... { Hon. M.	Dec. 4, 1867 Dec. 20, 1899	
STORROW, CHARLES STORER		
192 Beacon St., Boston, Mass.....		Jan. 24, 1893
WILSON, WILLIAM HASELL		
Pres., Belvidere Delaware R. R. Co., Room 246, Pennsylvania R. R. Station, Broad St., Philadelphia, Pa.....		Aug. 2, 1892

Honorary Members, 10.

It is particularly requested that every change of address be communicated immediately to:

THE SECRETARY, AMERICAN SOCIETY OF CIVIL ENGINEERS,

220 WEST FIFTY-SEVENTH STREET, NEW YORK, N. Y.

The awards of the Norman Medal, the Thomas Fitch Rowland Prize and the Collingwood Prize are indicated in this list by the letters **N.**, **R.** and **C.**, respectively, prefixed to the name of each recipient.

CORRESPONDING MEMBERS.

		Date of Membership.
GLEIM, CHARLES OTTO		
Civ. and Cons. Engr., Dorotheenstr., 184, Hamburg-Winter- hude, Germany.....		April 5, 1876
PONTZEN, ERNEST		
Civ. and Cons. Engr., 65 Rue Monceau, Paris, France.....		Jan. 5, 1876

Corresponding Members, 2.

MEMBERS.

[M. Am. Soc. C. E.]

		Date of Membership.
ABBOT, FREDERIC VAUGHAN		
Maj., Corps of Engrs., U. S. A., Office, Chief of Engrs., U. S. A., Washington, D. C.....		Dec. 3, 1884
ABBOT, FREDERICK WILLIAM		
Pres., Abbot Gamble Contr. Co.; Vice-Pres., National Conduit Co. of St. Louis, 620 Chestnut St., St. Louis, Mo.; also Vice-Pres., Phoenix Dredging Co., 5 Times Bldg., New York City.....	Assoc. M. M.	Oct. 7, 1891 April 1, 1896
ABBOTT, ARTHUR VAUGHAN	Jun. M.	Jan. 5, 1881 Dec. 4, 1901
ABERT, SYLVANUS THAYER		
Metropolitan Club, Washington, D. C.....		Sept. 21, 1870
ADAM, ROBERT		
Engr. in Chg., Salina Cruz Harbor Works, Salina Cruz, Oaxaca, Mexico		May 2, 1900
R. ADAMS, ARTHUR LINCOLN		
Engr. and Mgr., Contra Costa Water Co., 901 Broadway, Oak- land, Cal.....		Oct. 2, 1895
ADGATE, GEORGE		
734 Stock Exchange Bldg., Chicago, Ill.....		April 1, 1896
AERTSEN, GUILLIAEM		
Gen. Mgr., Latrobe Steel Co., 1200 Girard Bldg., Philadelphia, Pa		Oct. 1, 1890
AFRICA, JAMES MURRAY		
Chf. Engr., Pennsylvania Midland R. R.; City Engr., Hunt- ington, Pa.....		Sept. 2, 1896

AIKEN, WILLIAM AUGUSTIN			
Gen. Insp. of Material, Rapid Transit R. R. Commrs. of New York, 613 Empire Bldg., Pittsburg, Pa.....	Oct.	2, 1889	
AINSWORTH, DANFORTH HURLBUT			
1240 West 10th St., Des Moines, Iowa.....	Mar.	3, 1886	
ALDEN, JOHN FERRIS			
Contr. Dept., American Bridge Co., Rochester, N. Y.....	July	6, 1887	
ALDRICH, TRUMAN HEMINWAY			
Birmingham, Ala	May	4, 1881	
ALLEN, C. FRANK			
Prof. of R. R. Eng., Mass. Inst. of Tech., Boston, Mass	Feb.	6, 1878	
ALLEN, CALVIN HARLOW			
1 West 72d St., New York City.....	Sept.	7, 1887	
ALLEN, CHARLES ALBERT			
Cons. Engr., Worcester, Mass	June	4, 1879	
ALLEN, JAMES PIERNON			
8 Ladson St., Charleston, S. C.....	{ Jun.	Mar. 5, 1879	
ALLEN, KENNETH			
(Hill, Quick & Allen, Cons. Engrs.), 520 Equitable Bldg., Baltimore, Md..	May	2, 1888	
ALVORD, JOHN WATSON			
(Alvord & Shields, San. and Hydr. Engrs.), 127 Hartford Bldg., Chicago, Ill.....	Jan.	4, 1893	
AMBROSE, WILLIAM CREELMAN			
Fresno, Cal	April	4, 1888	
AMWEG, FREDERICK JAMES			
Chf. Engr., Honolulu Rapid Transit & Land Co., Honolulu, Hawaiian Islands.....	Mar.	7, 1888	
ANDERSEN, CHRISTIAN			
472 Park St., Portland, Ore.....	Jan.	2, 1901	
ANDERSON, LATHAM			
Kuttawa, Lyon Co., Ky.....	May	2, 1888	
ANDREWS, DANIEL MARSHALL			
U. S. Asst. Engr., Lincoln, Ala.....	Mar.	2, 1892	
ANDREWS, DAVID HERBERT			
38 Lake Ave., Newton Center, Mass	Sept.	2, 1885	
ANDREWS, HORACE			
51 State St., Room 46, Albany, N. Y.....	April	6, 1887	
ANNAN, CHARLES LE ROY			
Office Engr., C. O. & G. R. R., Little Rock, Ark.....	July	4, 1888	
APPLETON, ELLERY CUSHING			
Asst. Engr., Met. Water-Works, Westboro, Mass.....	June	3, 1885	
APPLETON, THOMAS			
Asst. to Supt. of Constr., U. S. Life Saving Service, Manasquan, N. J.....	April	4, 1883	
ARCHBALD, JAMES			
424 Jefferson Ave., Scranton, Pa.....	May	15, 1872	

		Date of Membership.
ARCHER, WILLIAM		
Prin. Asst. Engr., B. & O. S. W. R. R., Cincinnati, Ohio.....	Mar. 2, 1881	
ARCHIBALD, PETER SUTHER		
Cons. Engr., Moncton, N. B., Canada.....	Jan. 7, 1885	
AELNTZ, FREDERICK CHRISTIAN HOLBERG		
Engr., Highway Dept., Western Dist., American Bridge Co., 6017 Woodlawn Ave., Chicago, Ill ...	Assoc. M. May 6, 1891 M. Oct. 3, 1900	
ARGOLLO, MIGUEL DE TEIVE E		
Director and Chf. Engr., San Francisco R. R., Alagoinhas, Bahia, Brazil	Oct. 2, 1895	
ARMINGTON, JAMES HERVEY		
Cons. Engr., Riverside, R. I.....	July 6, 1870	
ARTINGSTALL, SAMUEL GEORGE		
240 Rialto Bldg., Chicago, Ill.....	Oct. 6, 1886	
ASHMEAD, FRANK MILLIGAN		
Asst. Engr., Penna. R. R., Pittsburg, Pa	July 6, 1887	
ASPINWALL, THOMAS		
3 Hamilton Pl., Boston, Mass.....	May 2, 1888	
ASSERSON, HENRY RAYMOND		
Chf. Engr., Sewers, Borough of Brooklyn, Room 42, Municipal Bldg., Brooklyn, N. Y.....	Oct. 2, 1901	
ASSERSON, PETER CHRISTIAN		
Civ. Engr., U. S. N., Navy Yard, Brooklyn, N. Y.....	July 5, 1882	
ATKINSON, JOHN BOND		
Pres., St. Bernard Coal Co.; Pres., Atpontley Coal Co., Earling- ton, Ky.....	Sept. 5, 1877	
ATWATER, ALMON BYRON		
Asst. Gen. Supt., Michigan Central Ry., Detroit, Mich.	May 5, 1886	
ATWOOD, JOHN ABIEL		
Chf. Engr., P. & L. E. R. R. Co., Beaver, Pa.....	Jan. 3, 1900	
AUCHINCLOSS, WILLIAM S.		
45 West 20th St., New York City.....	Feb. 17, 1869	
AUS, GUNWALD		
Cons. Engr., 111 Fifth Ave., New York City.....	April 3, 1895	
AXTELL, DECATUR		
Vice-Pres., Chesapeake & Ohio Ry. Co., and Chairman of Board of Directors, Toledo & Ohio Central Ry., Richmond, Va.....	Mar. 3, 1886	
AYCRIGG, WILLIAM ANDERSON		
Civ. Engr., with U. P. R. R., Omaha, Nebr.....	Assoc. M. May 4, 1892 M. May 4, 1898	
AYRES, HENRY WILCOX		
66 State St., Hartford, Conn.....	Mar. 5, 1890	
BABCOCK, HENRY NASH		
U. S. Asst. Engr., Army Bldg., 39 Whitehall St., New York City.	Sept. 3, 1884	
BACON, JAMES HAYWARD		
U. S. Asst. Engr., U. S. Engr. Office, Fernandina, Fla.....	Jan. 3, 1900	
BACON, JOHN WATSON		
Danbury, Conn.....	July 12, 1877	

BACOT, WILLIAM SINCLAIR			
Engr. and Gen. Mgr., Consolidated Water Co. of Utica, N. Y.	Oct. 1, 1890		
N. BAIER, JULIUS	{ Jun.	Sept. 7, 1887	
Asst. Mgr. and Engr., Conrey Placer Mining Co., Virginia City, Mont.	{ Assoc. M. M.	June 1, 1892 Feb. 6, 1901	
BAILEY, GEORGE IRVING			
Cons. Engr., 51 State St., Albany, N. Y.	Oct. 1, 1890		
BAKER, HOLLAND WILLIAMS			
Kirkwood, Mo.	May 7, 1890		
BAKER, IRA OSBORN			
702 W. University Ave., Champaign, Ill.	May 3, 1893		
BAKER, WILLIAM EDGAR			
Gen. Supt. and Chf. Elec. Engr., Manhattan Ry. Co., New York City	June 1, 1898		
BALBIN, ERNESTO JOAQUIN			
Chf. of the Light House Board of Cuba (Res., Virtudes No. 103), Havana, Cuba	Nov. 1, 1893		
BALDWIN, FRED HIXON			
Asst. Supt., Bergenport Chemical Works, Bayonne, N. J.	Nov. 5, 1884		
BALDWIN, HENRY FURLONG			
Chf. Engr., Chicago & Alton Ry. Co., 919 Monadnock Bldg., Chicago, Ill.	{ Assoc. M. M.	Dec. 7, 1892 Feb. 6, 1895	
BALDWIN, THOMAS WILLIAMS			
Boothbay Harbor, Me.	April 2, 1884		
BALDWIN, WARD	{ Jun.	Mar. 2, 1882	
Cons. Engr., 9 West 4th St., Cincinnati, Ohio	{ M.	Oct. 2, 1889	
BALDWIN, WILLIAM HENRY			
Warburton Bldg., Yonkers, N. Y.	June 6, 1888		
BALDWIN, WILLIAM JAMES			
Cons. Engr., 107 West 17th St., New York City	Sept. 5, 1888		
BALL, CHARLES BACKUS			
Chf. San. Insp., Tenement House Dept., 61 Irving Pl., New York City.	Oct. 1, 1890		
BALLARD, ROBERT			
26 Mansion House Chambers, London, E. C., England	Sept. 1, 1880		
BARBOUR, FRANK ALEXANDER			
Civ. and San. Engr. (Snow & Barbour), 1120 Tremont Bldg., Boston, Mass.	Sept. 5, 1900		
BARDOL, FRANK VALENTINE ERHARD			
Chf. Engr., Bureau of Eng., 437 East Utica St., Buffalo, N. Y.	May 2, 1900		
BARLOW, JOHN QUINCY	{ Jun.	April 7, 1886	
Div. Engr., Idaho Div., Oregon Short Line R. R., Pocatello, Idaho	{ M.	July 4, 1888	
BARNARD, JOHN FISK			
Pres., St. Clair, Madison & St. Louis Belt R. R. Co.; Res., 117 South 15th St., St. Joseph, Mo.	Sept. 1, 1880		
BARNES, OLIVER WELDON			
Cons. Engr., Fishkill, Dutchess Co., N. Y.	July 6, 1881		

Date of
Membership.

BARNES, THOMAS HOWARD			
Civ. and Municipal Engr., 7 Water St., Boston, Mass	Oct.	4,	1899
BARR, JACOB NEFF			
Mech. Supt., Erie R. R., Susquehanna, Pa.....	Nov.	7,	1888
BASSEL, ROBERT			
Grüner Weg, 49, II, Prenzlau, Germany.....	May	2,	1888
BASSETT, CARROL PHILLIPS			
Treas., Essex-Union Water & Light Co., Summit, N. J.....	Nov.	7,	1888
BASSETT, GEORGE BARCLAY			
363 Washington St., Buffalo, N. Y.....	Mar.	1,	1893
BATES, ONWARD			
Pres., Bates & Rogers Constr. Co., 1203 Manhattan Bldg., Chicago, Ill	Jan.	4,	1882
BAXTER, FRANK EDWIN			
Res. Engr., Rio Grande Western Ry., 867 East Third South St., Salt Lake City, Utah	Oct.	2,	1901
BAXTER, GEORGE STRONG			
Railroad and lumber business, 18 Wall St., New York City	Jan.	May 12,	1875
BAYLISS, RAWLINSON TENNANT			
11 Cornhill, London, E. C., England.....	May	3,	1876
BEACH, ROBERT JAMES			
149 Broadway, New York City (Res., Pelham Manor, N. Y.)...	June	4,	1890
BEAHAN, WILLARD			
Div. Engr., C. & N. W. Ry., Winona, Minn.....	May	2,	1900
BEARD, EDWARD JAMES			
Prin. Asst. Engr., Choctaw, Oklahoma & Gulf R. R., Hartshorne, Ind. T.....	April	3,	1889
BEARDSLEY, ARTHUR			
Emeritus Prof. of Eng., Swarthmore College, Swarthmore, Pa.....	Assoc.	Sept. 1,	1875
	M.	Sept. 2,	1891
BEARDSLEY, JAMES WALLACE			
U. S. Asst.. Engr., U. S. Engr. Office, Old Custom House, Detroit, Mich.....	Dec.	4,	1901
BECKLER, ELBRIDGE HARLOW			
Engr. and Supt., Winston Bros., R. R. Contrs., 1838 Aldine Ave., Chicago, Ill.....	April	6,	1892
BECKWITH, FRANK			
Engr. of Iowa Lines, C. B. & Q. R. R., Burlington, Iowa.....	Nov.	7,	1900
BELKNAP, WILLIAM ETHELBERT			
Asst. Engr., Dept. of Docks and Ferries, New York	Jun.	Mar. 31,	1891
City; Address, 697 West End Ave., New York City.	Assoc.	Mar. 6,	1895
	M.	Dec. 1,	1897
BELL, ALONZO CLARENCE			
5518 Chestnut St., New Orleans, La.....	Mar.	7,	1900
BELL, ANDREW			
Cons. Engr., Almonte, Ont., Canada.....	Sept.	5,	1883
BELL, GILBERT JAMES			
Asst. Engr., A., T. & S. F. Ry., 517 North Broad St., Galesburg, Ill.....	Jun.	Sept. 7,	1887
	M.	Oct.	6, 1897

BELL, HENRY PURDON			
Victoria, B. C., Canada.....	.....	June 4, 1884	
BELL, JAMES RICHARD			
Hazeldeene, Ightham, Kent, England.....	.....	Sept. 2, 1896	
BELLINGER, LYLE FREDERICK			
Civ. Engr., U. S. N., Navy Yard (Res., 159 Cumberland St.), Brooklyn, N. Y.....	.....	Nov. 6, 1901	
BEMENT, ROBERT BUNKER COLEMAN			
Pres., Board of Water Commrs., City of St. Paul; Civ. and Cons. Engr., 23 East 5th St., St. Paul, Minn .....	.....	Sept. 7, 1887	
BENSEL, JOHN ANDERSON			
Engr. in Chf., Dept. of Docks and Ferries, New York City. { Jun. M. Mar. 4, 1891	.....	Sept. 2, 1885	
BENSON, ORVILLE			
Mgr., New Jersey & Pennsylvania Concentrating Works, Edison, N. J .....	.....	June 5, 1901	
BENT, CORNELIUS CONWAY FELTON			
Supt. and Gen. Agt., B. & O. R. R., Philadelphia, Pa.....	.....	May 1, 1889	
BENZENBERG, GEORGE HENRY (<i>Vice-President.</i>)			
Cons. Engr., Milwaukee, Wis.....	.....	May 2, 1883	
BERG, LOUIS DECOPPET			
Archt., 31 East 17th St., New York City.....	.....	{ Assoc. June 6, 1888	
BERG, WALTER GILMAN			
Chf. Engr., Lehigh Valley R. R. (Res., 261 West 52d St.), New York City.....	.....	Sept. 2, 1891	
BERGEN, VAN BRUNT			
The Shore Road and 77th St., Brooklyn, N. Y.....	.....	Feb. 5, 1896	
BERRIAN, RICHARD MILFORD			
255 West 128th St., New York City.....	.....	June 17, 1868	
BETTS, FRED KEELER			
West Shokan, Ulster Co., N. Y.....	.....	May 4, 1898	
BIDDLE, JOHN			
Maj., Corps of Engrs., U. S. A.; Engr. Commr., District of Columbia, Washington, D. C.....	.....	July 4, 1894	
BIDDLE, WILLIAM FOSTER			
4305 Spruce St., Philadelphia, Pa.....	.....	June 4, 1884	
BIGELOW, EDWARD MANNING			
Civ. Engr., Pittsburgh, Pa.....	.....	Dec. 4, 1889	
BILLIN, CHARLES EMERY			
Pres., American Engineering Works, 204 Dearborn St., Chicago, Ill. .	.....	{ Jun. M. April 5, 1876 July 3, 1878	
BISBEE, FRED MILTON			
Chf. Engr., Tenn. Const. Co.; Chf. Engr., Tenn. Central Ry. Co., Homestead Bldg., Nashville, Tenn.....	.....	May 3, 1899	
BISHOP, GEORGE H.			
129 Main St., Middletown, Conn..	.....	Aug. 7, 1872	
BISELL, FRANK EDWARD			
First Asst. Engr., L. S. & M. S. Ry., Cleveland, Ohio. .	.....	{ Jun. M. April 2, 1884 Sept. 2, 1891	

Date of
Membership.

BISSELL, HEZEKIAH			
Chf. Engr., B. & M. R. R., West Medford, Mass.....		Sept. 15, 1869	
BIXBY, WILLIAM HERBERT			
Maj., Corps of Engrs., U. S. A., U. S. Engr. Office, Jones Bldg., Detroit, Mich.....		April 5, 1882	
R. BLACK, WILLIAM MURRAY			
Maj., Corps of Engrs., U. S. A., Commanding U. S. Engr. School, 3d Battalion of Engrs. and Post of Washington Bar- racks, Washington, D. C.....		June 6, 1888	
BLACKFORD, FRANCIS WEBSTER			
Civ. and Min. Engr., Cerro de Pasco, Peru.....		April 4, 1888	
BLACKWELL, CHARLES			
Wheeling & Lake Erie R. R., Cleveland, Ohio.....		Sept. 7, 1881	
BLAISDELL, ANTHONY HOUGHTALING			
Civ. Engr. with Missouri River Comm., 2739 Locust St., St. Louis, Mo.. .		Mar. 3, 1880	
BLAKE, EDWARD JOSIAH			
Cons. Engr., C., B. & Q. R. R. Co., Chicago, Ill.		April 3, 1889	
BLAKELEY, GEORGE HENRY			
Chf. Engr., Passaic Rolling Mill Co., Paterson, N. J... { M.	Jun. { M.	Dec. 4, 1889 Oct. 2, 1895	
BLAKESLEE, CLARENCE			
598 George St., New Haven, Conn.....		June 4, 1895	
BLAND, GEORGE PIERREPONT			
510 Harrison Bldg., Philadelphia, Pa..... { M.	Jun. { M.	April 7, 1875 May 4, 1881	
BLAND, JOHN CARLISLE			
Engr. of Bridges, Pennsylvania Lines West of Pitts- { Jun. burg, Pittsburg, Pa..... { M.	Jun. { M.	June 1, 1875 June 4, 1879	
BLUNT, WILLIAM TITCOMB			
U. S. Asst. Engr., U. S. Engr. Office, Cleveland, Ohio (Res. and P. O. Address, Toledo, Ohio).....		Oct. 5, 1898	
BODY, JOHN BENJAMIN			
Gen. Mgr., Tehuantepec National Ry., Coatza- { Assoc. M. coalecos, Mexico..... { M.	Jun. { M.	Oct. 2, 1895 May 2, 1900	
BOEHMER, MAX			
Min. Engr., 42 Jacobson Bldg., Denver, Colo.....		Oct. 5, 1898	
BOGART, JAMES PETER			
Office, 82 Church St. (Res., 684 Whitney Ave.), New { Jun. Haven, Conn..... { M.	Jun. { M.	Jan. 4, 1882 July 3, 1895	
BOGART, JOHN			
Cons. Engr., 40 Wall St., New York City.....		Feb. 17, 1869	
BOGGS, EDWARD MARSHALL			
Cons. Civ. and Hydr. Engr., 534 Stimson Blk., Los Angeles, Cal.....		June 6, 1900	
BOGUE, VIRGIL GAY			
118 Manhattan Life Ins. Bldg., 66 Broadway, New York City...		Sept. 15, 1869	
BOLLER, ALFRED PANCOAST			
Cons. Engr., 1 Nassau St., New York City.....		Dec. 4, 1867	

BOLTON, CHANNING MOORE		
Cons. Engr., Rio, Albemarle Co., Va.....	Jan.	4, 1888
BOLTON, REGINALD PELHAM		
Cons. Expert, 35 Nassau St., New York City.....	Sept.	6, 1899
BOND, EDWARD AUSTIN		
State Hall, Albany, N. Y.....	Sept.	6, 1899
BOND, FREDERICK WINN		
Chf. Engr., Fort Smith & Western R. R., Fort Smith, Ark.....	Dec.	7, 1898
BOND, GEORGE MEADE		
Mgr., Standards and Gauge Dept., Pratt & Whitney Co. (Res., 141 Washington St.), Hartford, Conn.....	Feb.	2, 1887
BONNETT, WILLIAM WHITLOCK		
Waterbury, Conn	Sept.	4, 1872
BONTECOU, DANIEL		
505 Postal Telegraph Bldg., Kansas City, Mo.....	Nov.	5, 1879
BONZANO, ADOLPHUS		
Pres., Bonzano Rail Joint Co. (Res., 331 South 18th St.), Philadelphia, Pa.....	Aug.	7, 1872
BONZANO, MAXIMILIAN FERDINAND		
Chf. Engr., Pittsburg, Shawmut & Northern R. R., Olean, N. Y.	Jan.	6, 1886
BOOTH, WILLIAM HENRY		
The British Electric Traction Co., Ltd., Donington House, Norfolk St., Strand, London, W. C., England.....	July	4, 1888
BOTH, CARL CHRISTIAN ADOLPH		
U. S. Asst. Engr., U. S. Engr. Office, Portland, Me.....	Sept.	2, 1891
BOTT, JOHN B.		
Engr., P. R. R., Lock Box 11, Brownsville, Pa.....	Oct.	1, 1890
BOUSCAREN, LOUIS FREDERIC GUSTAVE		
Cons. Engr., City Hall, Cincinnati, Ohio.....	April	7, 1875
BOWIE, AUGUSTUS JESSE		
Cons. Engr., 217 Sansome St., San Francisco, Cal..	Nov.	1, 1882
BOWMAN, AUSTIN LORD		
Cons. Engr., 29 Broadway, New York City	{ Assoc. M. M.	Sept. 7, 1892 Dec. 1, 1897
BOYNTON, GEORGE HERBERT		
Asst. Engr., C., R. I. & P. Ry. Co., 342 Rialto Bldg., Chicago, Ill.	Sept.	3, 1884
BRACKENRIDGE, JOHN CROSBIE		
Gen. Mgr., Brooklyn Heights R. R. Co., 168 Montague St., Brooklyn, N. Y.....	May	5, 1897
BRACKENRIDGE, WILLIAM ALGERNON		
Engr., Niagara Falls Power Co., and allied companies, Niagara Falls, N. Y.....	June	2, 1886
BRACKETT, DEXTER		
Engr., Distrib. Dept., Met. Water-Works, 1 Ashburton Pl., Boston, Mass.....	June	6, 1888
BRADFORD, WILLIAM		
513 Fitzsimons Bldg., 331 Fourth Ave., Pittsburg, Pa.....	Dec.	7, 1898
BRADLEY, DANIEL EDWARD		
Berlin, Conn	May	1, 1895

Date of
Membership.

BRADLEY, WILLIAM HAMMATT			
53 State St., Boston, Mass.....		Feb. 5, 1879	
BRAMWELL, GEORGE WASHINGTON			
Cons. Engr., 335 Broadway, New York City.....		Mar. 1, 1893	
BRECKINRIDGE, CABELL			
Cons. Civ. Engr., Danville, Ky.....		June 1, 1881	
BREEN, HOWARD			
531 N. Raymond St., Pasadena, Cal.....		April 4, 1888	
R. BREITHAUPt, WILLIAM HENRY	{ Jun.	June 4, 1884	
Berlin, Ont., Canada.....	{ M.	July 6, 1887	
BREMNER, GEORGE HAMPTON			
Asst. Engr., C., B. & Q. R. R., 209 Adams St., Chicago, Ill.....		Dec. 6, 1899	
BRENDLINGER, PETER FRANKLIN			
Engr. and Contr., Room 409, Harrison Bldg., Philadelphia, Pa. (Res., Narberth, Pa.).....		Sept. 7, 1887	
BREUCHAUD, JULES			
Engr. and Contr., Croton Dam Contract, Croton-on-Hudson, N. Y. (Res., Park Hill, Yonkers, N. Y.).....	{ Assoc. M.	June 5, 1889 Oct. 5, 1898	
BRIGGS, JOSIAH ACKERMAN (<i>Director</i>)			
Chf. Engr. in and for the Borough of the Bronx, New York City		Sept. 1, 1886	
BRIGGS, ROSWELL EMMONS			
Apartado 561, City of Mexico, Mexico		Sept. 15, 1869	
BRINCKERHOFF, ALEXANDER GORDON			
Supt. Works, Johnson & Morris, 30 West 13th St., New York City.....		Nov. 3, 1886	
BRINCKERHOFF, HENRY WALLER			
Cons. Engr., 45 Broadway, New York City.....		Nov. 7, 1883	
BRINSMADE, DANIEL SEYMOUR			
Pres. and Engr., The Ousatonic Water Co., Derby, Conn		Feb. 1, 1888	
BRODHEAD, CALVIN EASTON			
Greenville, Mercer Co., Pa.....		Feb. 21, 1872	
BROOKS, FREDERICK	{ Jun.	June 7, 1876	
31 Milk St., Boston, Mass.....	{ M.	Jan. 2, 1884	
BROWN, ALBA FISK			
271 Fortieth St., Pittsburg, Pa.....		Sept. 7, 1887	
BROWN, CHARLES CARROLL			
Cons. Engr.; Editor, <i>Municipal Engineering Magazine</i> , 84 Commercial Club Bldg., Indianapolis, Ind		Oct. 2, 1895	
BROWN, CHARLES OTTO	{ Jun.	Jan. 6, 1875	
200 Bushwick Ave., Brooklyn, N. Y.....	{ M.	Nov. 7, 1877	
BROWN, GILLMOR			
Chf. Engr., Ohio Valley Electric Ry. Co., Pomeroy, Ohio.....		May 6, 1896	
BROWN, LE GRAND			
Chf. Engr., Rochester Ry. Co., Rochester, N. Y.....		May 4, 1898	
BROWN, LINUS WEED			
741 Carondelet St., New Orleans, La.....		June 7, 1899	
BROWN, RALPH HENRY			
Chf. Engr., Eastern Bridge & Structural Co., 58 Front St., Worcester, Mass.....		June 7, 1899	

BROWN, THOMAS ELLIS		{ Jun.	Nov. 3, 1880
Chf. Engr., Otis Elevator Co., 71 Broadway, New York City	{ M.	April 2, 1884	
BROWN, WILLIAM MAXWELL			
Engr., Met. Sewerage Works, Pemberton Bldg., Boston, Mass.	Feb.	5, 1896	
BROWNE, GEORGE HAMILTON			
Gen. Mgr., Philadelphia Co., 820 Penn Ave., Pittsburg, Pa.	Sept.	3, 1884	
BROWNE, WILLIAM ROBERT			
Supt., Bureau of Surveys, City Hall, Pittsburg, Pa.	June	1, 1898	
BROWNLEE, JAMES LEEMAN			
P. O. Box 121, Knoxville, Tenn.	May	6, 1896	
BRUCE, FRED WILLIAM			
U. S. Asst. Engr., Mayport, Fla.	April	4, 1900	
BRUNNER, JOHN			
Supt., Bureau of Constr., Dept. of Public Works (Res., 417 Denniston Ave.), Pittsburg, Pa.	Mar.	2, 1898	
BRYSON, ANDREW			
Brylgon Foundry, Reading, Pa.	April	1, 1885	
BUCHANAN, EDWARD EVERETT			
407 W. Church St., Elmira, N. Y.	Dec.	4, 1889	
BUCHHOLZ, CARL WALDEMAR			
Chf. Engr., Erie R. R., 21 Cortlandt St., New York City	Sept.	1, 1886	
N. BUCK, LEFFERT LEFFERTS			
Chf. Engr., New East River Bridge Comm., 84 Broadway, Brook- lyn, N. Y.; Private office, 46 East 21st St., New York City	Feb.	3, 1875	
R. BUCK, RICHARD SUTTON (<i>Director.</i>)			
Chf. Engr., East River Bridges Nos. 3 and 4, Park Row Bldg., New York City	{ Assoc. M. M.	April 5, 1893 Mar. 2, 1898	
BUCK, WALDO EMERSON			
Pres. and Treas., Worcester Mfrs. Mutual Ins. Co., 53 William St., Worcester, Mass.	July	3, 1889	
BUDGE, EDWARD BARNARD			
Engr. in Chf., 1st Section, Chili State Rys., Bella Vista Station, Valparaiso, Chili	Nov.	6, 1901	
BUDGE, ENRIQUE			
Valparaiso, Chili	Feb.	1, 1882	
BULLOCK, WILLIAM DEXTER			
Asst. Engr. in Chg., Bridges and Harbor, City Engr.'s Office, Providence, R. I.	{ Jun. M.	Sept. 5, 1887 July 4, 1888	
BURBANK, GEORGE BARKER			
Cons. Engr., 15 Wall St., New York City	July	4, 1888	
BURDEN, JAMES A.			
Pres., The Burden Iron Works, Woodside, Troy, N. Y.	July	2, 1879	
BURGWYN, COLLINSON PIERREPONT EDWARDS			
Cons. Engr., 819 Main St., Richmond, Va.	Nov.	1, 1882	
BURKE, MILO DARWIN			
406 Pike Bldg., Cincinnati, Ohio	July	4, 1894	
BURNS, EDWARD COOK			
417 Spring St., Jamestown, N. Y.	July	5, 1882	

Date of
Membership.

BURNS, ROBERT BRUCE	Chf. Engr., Santa Fé System, Lines West of Albuquerque; Address, 2642 Vermont Ave., Los Angeles, Cal.	Sept. 5, 1900
BURPEE, MOSES	Chf. Engr., Bangor & Aroostook R. R., Houlton, Me.	Sept. 3, 1884
BURR, EDWARD	Capt., Corps of Engrs., U. S. A. Washington Barracks, Washington, D. C.	May 6, 1891
R. BURR, WILLIAM HUBERT	Prof. of Civ. Eng., Columbia Univ.; Cons. Engr., 151 West 74th St., New York City.	Jun. June 3, 1874 Assoc. May 5, 1880 M. Mar. 3, 1886
BURROWES, FRANCIS SMITH	U. S. Asst. Engr., U. S. Engr. Office, Portland, Me.	June 6, 1888
BURTON, ALFRED EDGAR	Prof. of Topographical Eng., Mass. Inst. of Technology, Boston, Mass.	Sept. 4, 1901
BURTON, STANDISH BARRY	Gen. Mgr., La Belle Creale Mining Co., Saltillo, Coahuila, Mexico.	June 1, 1898
BUSH, HARRY DEAN	Care, Dominion Bridge Co., Ltd., Montreal, Que., Canada.	May 2, 1888
BUTLER, MATTHEW JOSEPH	22 Wellington Pl., Toronto, Ont., Canada.	April 1, 1885
BUTTERFIELD, FRANCIS EAVES	Culiacan, Sinaloa, Mexico.	Sept. 1, 1886
BUXTON, CLIFFORD	Chf. Engr., Toledo & Ohio Central and Kanawha & Michigan Rys., Toledo, Ohio.	May 6, 1885
C. BYERS, MORTON LEWIS	Engr., M. of W., Baltimore & Ohio Ry. System, B. & O. Central Offices, Baltimore, Md.	Jun. Jan. 2, 1890 M. Sept. 7, 1898
BYLLESBY, HENRY MANSON	First Vice-Pres., Electric Vehicle Co.; First Vice-Pres. and Gen. Mgr., Riker Motor Vehicle Co., 100 Broadway, New York City.	June 1, 1887
CAIN, WILLIAM	Univ. of North Carolina, Chapel Hill, N. C.	Nov. 7, 1888
CAIRNS, ROBERT ANDREW	City Engr., Waterbury, Conn.	Oct. 2, 1895
CALKINS, FRANK AUGUSTUS	Edgewater, Jefferson Co., Colo.	April 5, 1882
CAMP, WALTER MASON	Chf. Editor, <i>Railway and Engineering Review</i> , 1305 Manhattan Bldg., Chicago, Ill.	May 1, 1901
CAMPBELL, CHARLES EDWARD HENRY	Bridge Engr. and Contr., Council Bluffs, Iowa.	Oct. 3, 1883
CAMPBELL, HARRY HUSE	Gen. Mgr., The Pennsylvania Steel Co., Steelton, Pa.	June 6, 1894

CAMPBELL, JOHN LOGAN			
Chf. Engr., Gasconade Railway Constr. Co., 916 Security Bldg., St. Louis, Mo.....		May 1, 1901	
CANFIELD, EDWARD			
Gen. Supt., N. Y., O. & W. Ry. Co., Middletown, N. Y.....	Dec. 3, 1879		
CAPLES, MARTIN JOSEPH			
Engr., M. of W., Columbus, Sandusky & Hocking R. R., Columbus, Ohio.....	Assoc. M. M. Nov. 4, 1891 Oct. 4, 1899		
CAPPELEN, FREDERICK WILLIAM			
Cons. Engr., 702 Oneida Blk., Minneapolis, Minn.....	April 3, 1895		
CARD, WILLIAM WARREN			
Seey., The Westinghouse Air Brake Co., Pittsburg, Pa.....	Sept. 5, 1883		
CARLL, DAVID SYLVANUS			
Chf. Engr., Capital Traction Co., Washington, D. C.....	Jun. Assoc. M. M. Mar. 7, 1888 July 1, 1891 Oct. 7, 1896		
CAROTHERS, DANIEL DAWSON			
Supt., B. & O. R. R., Chicago, Ill.....	April 4, 1894		
CARR, WALTER FRANK			
2819 Dunbar Pl., Milwaukee, Wis.....	June 6, 1894		
CARROLL, EUGENE			
Chf. Engr. and Supt., Butte Water Co., Butte, Mont.....	Jun. Assoc. M. M. June 4, 1888 July 1, 1891 June 2, 1897		
CARSON, HOWARD ADAMS			
Chf. Engr., Boston Transit Comm., 20 Beacon St., Boston, Mass.	Feb. 7, 1894		
CARSON, WILLIAM WALLER			
Prof. of Civ. Eng., Univ. of Tennessee, Knoxville, Tenn.....	Nov. 2, 1892		
CARTER, EDWARD CARLOS (<i>Director.</i>)			
Chf. Engr., Chicago & Northwestern Ry., Chicago, Ill.....	April 4, 1888		
CARTER, HENRY HALL			
Cons. Engr., 95 Milk St., Boston, Mass.....	May 7, 1890		
CARTER, J. RIVERS			
Care, Southern Club, Birmingham, Ala	Feb. 3, 1892		
CARTWRIGHT, ROBERT			
Cons. Engr., 6 Bates St., Rochester, N.Y.....	July 10, 1872		
CATT, GEORGE WILLIAM			
Pres. and Chf. Engr., Atlantic, Gulf & Pacific Co.; Cons. Engr., San Francisco Bridge Co.; Cons. Engr., Puget Sound Bridge & Dredging Co., Park Row Bldg., New York City.....	Sept. 7, 1892		
CATELL, WILLIAM ASHBURNER			
Cons. Engr., 52 Broadway, New York City.....	Assoc. M. M. May 6, 1891 Oct. 7, 1896		
CHAMBERLAIN, PHILLIP WILLIAM			
Cons. Engr., Dept. of Public Works of Nicaragua, Greytown, Nicaragua	Oct. 2, 1895		
R. CHANUTE, OCTAVE (<i>Past-President.</i>)	(M. F.		
Cons. Engr., 413 East Huron St., Chicago, Ill.....	July 11, 1878		
CHAPIN, LOOMIS EATON			
Jun. Assoc. M. M. Cons. Engr., 228 West 8th St., Canton, Ohio.....	Dec. 3, 1884 Sept. 7, 1892 Nov. 4, 1896		

Date of
Membership.

CHASE, JAMES RUSSELL			
Gen. Mgr., Met. District Elec. Traction Co., Ltd., 37 Hamilton House, Victoria Embankment, London, E. C., England.....	Mar.	6, 1901	
CHASE, CHARLES FRANCIS			
Civ. and Cons. Engr., 75 Westminster St., Providence, R. I....	Jan.	1, 1896	
CHASE, FRANK LYNTON			
Asst. Engr. of Bridges, N. Y. C. & H. R. R., Grand Central Station, New York City.....	{ Assoc. M. M.	Nov. 4, 1896 Nov. 1, 1899	
CHASE, JOHN CARROLL			
Chf. Engr., The Clarendon Water-Works Co., Wilmington, N. C.	Mar.	1, 1893	
CHASE, WILLIAM BEVERLY			
City Engr., Portland, Ore.....	Sept.	6, 1899	
CHEEVER, ALBERT SAFFORD			
Asst. Chf. Engr., Boston & Maine R. R., Boston, Mass.....	June	7, 1893	
CHENEY, JOHN EUGENE			
Asst. City Engr., City Hall, Boston, Mass.....	May	7, 1884	
CHESTER, JOHN NEEDELS			
Chf. Engr., American Water-Works & Guarantee Co., 1200 Bank for Savings Bldg., Pittsburg, Pa..	{ Jun. Assoc. M. M.	Dec. 6, 1892 Dec. 5, 1894 Mar. 6, 1901	
CHIBAS, EDUARDO JUSTO			
Gen. Mgr. and Chf. Engr., Guantanamo R. R. Co., Guantanamo, Cuba.....	{ Jun. Assoc. M. M.	Mar. 31, 1891 May 6, 1896 Jan. 3, 1900	
CHILD, STEPHEN			
(Drabbington Lodge) Kendal Green Station, Weston, Mass....	Oct.	5, 1898	
CHILD, JAMES EDMUND			
Gen Mgr., N. Y., O. & W. Ry., Office, 56 Beaver St. (Res., 300 West 93d St.), New York City.....	Dec.	4, 1878	
CHIPMAN, WILLIS			
103 Bay St., Toronto, Ont., Canada.....	June	6, 1888	
CHITTENDEN, HIRAM MARTIN			
Capt., Corps of Engrs., U. S. A., Sioux City, Iowa.....	Feb.	7, 1900	
CHRISTIE, GEORGE B.			
171 La Salle St., Chicago, Ill.....	Oct.	2, 1895	
N. CHRISTIE, JAMES			
Chf. Mech. Engr., Pencoyd Iron Works, Pencoyd, Pa	May	7, 1873	
CHURCH, CHARLES TITUS			
155 William St., Geneva, N. Y.....	May	1, 1889	
CHURCH, GEORGE EARL			
Dashwood House, 9 New Broad St., London, E. C., England...	Nov.	2, 1887	
CHURCHILL, CHARLES SAMUEL			
Engr., M. of W., Norfolk & Western Ry., Roanoke, Va.....	May	1, 1889	
CHURCHILL, JOHN CHARLES, Jr.			
U. S. Asst. Engr., Oswego, N. Y.....	Feb.	1, 1899	
CLAPP, LORENZO RUSSELL			
Hempstead, Nassau Co., N. Y.....	Feb.	1, 1888	
CLAPP, OTIS FRANCIS			
City Engr., Providence, R. I.....	Mar.	2, 1898	

CLARK, GEORGE HUNTINGTON			
Gen. Mgr., Birmingham Belt R. R. Co., 2104 First Ave., Birmingham, Ala.....		Mar.	5, 1890
CLARKE, DAVID DEXTER			
Engr., The Water Committee, City Hall, Portland, Ore.		July	5, 1882
N. CLARKE, ELIOT CHANNING			
15 Brimmer St., Boston, Mass.....		Sept.	4, 1878
CLARKSON, ROBERT COOKE			
Cons. Engr., 710 Stephen Girard Bldg., Philadelphia, Pa. { M.	Jun.	Jan.	5, 1887
CLAUSSEN, OSCAR			
City Engr. and Commr. of Public Works, St. Paul, Minn.		Oct.	2, 1901
CLAYTON, ROBERT MORRIS			
City Engr., Atlanta, Ga.		Mar.	4, 1896
CLEMENT, FRANK HUDSON			
Engr. and Contr., 32 South Broad St., Philadelphia, Pa.		Nov.	1, 1882
CODWISE, EDWARD BERTIE			
City Engr., Kingston, Ulster Co., N. Y.		Sept.	5, 1888
COE, WILLIAM WATSON			
Radford, Va.		April	3, 1889
COFFIN, AMORY			
33 East 17th St., New York City.....		Mar.	3, 1875
COFFIN, FREEMAN CLARKE			
Civ. and Hydr. Engr., 53 State St., Boston, Mass.....		Feb.	6, 1895
COFFIN, THOMAS AMORY			
32 Broadway, New York City..... { M.	Jun.	Oct.	2, 1894
COGSWELL, WILLIAM BROWN			
Vice-Pres. and Managing Director, The Solvay Process Co., Syracuse, N. Y.... { M.	Assoc.	Feb.	15, 1871
COHEN, MENDES (<i>Past-President</i>)			
825 North Charles St., Baltimore, Md.....		Dec.	4, 1867
COLBY, BRANCH HARRIS			
(Colby & Baker, Civ. and Cons. Engrs.), 708 Lincoln Trust Bldg., St. Louis, Mo.		June	5, 1895
COLE, HOWARD JUDSON			
29 Broadway, New York City..... { M.	Assoc.	Jan.	6, 1892
COLE, JOHN ADAMS			
(John A. Cole & Son); Cons. Engr., 1580 Old Colony Bldg., Chicago, Ill.		Mar.	1, 1899
COLEMAN, CLARENCE			
U. S. Asst. Engr., Duluth, Minn.		Nov.	3, 1897
COLEMAN, JOHN FRANCIS			
(Coleman & Maloché, Cons. Engrs.), 319 Carondelet St., New Orleans, La.		Oct.	2, 1901
COLLINGWOOD, FRANCIS			
Cons. Engr., Elizabeth, N. J.; Office address, 220 West 57th St., New York City.....		Mar.	10, 1869
COLLINS, DANIEL CHARLES NEWMAN			
Cons. and Contr. Engr., 29 Broadway, New York City.....		April	3, 1901

Date of
Membership.

COMSTOCK, CYRUS BALLOU				
Bvt. Brig.-Gen., U. S. A., 34 West 25th St., New York City.....				Sept. 1, 1880
CONDRON, THEODORE LINCOLN				
Cons. Engr. and Representative of the Pittsburg Testing Laboratory, Ltd., 1750 Monadnock Bldg., Chicago, Ill.....	Assoc. M. M.	Feb. 1, 1899 Oct. 2, 1901		
CONNELL, ALBERT NEWMANN				
Chf. Engr., J. G. White & Co., Ltd., 22a College Hill, London, E. C., England.....	Jun. M.	June 6, 1883 Oct. 1, 1890		
CONNOR, EDWARD HANSON				
Engr., Missouri Valley Bridge & Iron Works, Leavenworth, Kans.....	Jun. Assoc. M. M.	Feb. 5, 1890 Feb. 3, 1892 April 4, 1900		
CONSTABLE, CASIMIR				
Constableville, N. Y.....				June 17, 1868
CONSTABLE, HOWARD				
Archt. and Engr., 22 East 16th St., New York City.....				Dec. 7, 1892
COOKE, CHARLES HENRY				
Chf. Engr., Jamestown, Chautauqua & Lake Erie Ry., 55 Broadway (Res., 32 West 21st St.), New York City.....				Mar. 1, 1899
COOLEY, LYMAN EDGAR				
21 Quincy St., Chicago, Ill. (Res., Evanston, Ill.).....				June 1, 1898
COOPER, SAMUEL LISPENARD				
Commr. of Public Works, Yonkers, N. Y.....				Feb. 6, 1889
N. COOPER, THEODORE				
Cons. Engr., 35 Broadway, New York City.....				Mar. 4, 1874
CORNELL, GEORGE BIRDSELL				
Cons. Engr., 52 Broadway, New York City.....	Jun. M.	Aug. 6, 1879 Oct. 6, 1886		
CORTHELL, ARTHUR BATEMAN				
Res. Engr., The Boston Terminal Co., South Station, Boston, Mass.....				Mar. 1, 1899
CORTHELL, ELMER LAWRENCE				
Care, Hall, Eddy & Cia., 399 Reconquista, Buenos Aires, Argentine Republic, and 1 Nassau St., New York City.....				Sept. 2, 1874
COTTON, JOSEPH P.				
Newport, R. I.....				June 7, 1876
COURTENAY, WILLIAM HOWARD				
Prin. Asst. Engr., L. & N. R. R. Co., Louisville, Ky.....				July 3, 1889
COVODE, JAMES HENRY				
Berkeley, Cal.....				April 2, 1890
COWLES, WALTER LINSLEY				
Secy. and Mgr., D. F. Holman Railway Tracklayer Co., Hartford Bldg., Chicago, Ill.....				Mar. 6, 1889
COX, ABRAHAM BEEKMAN				
Cherry Valley, N. Y				May 7, 1873
CRAIG, CHAMBERS MCKIBBIN				
Hagerstown, Md				Nov. 3, 1886
CRAIGHILL, WILLIAM PRICE (<i>Past-President.</i>)				
Retired Chief of Engrs. and Brig.-Gen., U. S. A., Charlestown, Jefferson Co., W. Va.....	M. Hon. M.	Oct. 7, 1885 Mar. 23, 1896		

MEMBERS.

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		Date of Membership.
CRANDALL, CHARLES LEE		
Prof. of Railway Eng. and Geodesy, Cornell Univ., Ithaca, N. Y.	{ Jun. M.	June 7, 1876 Oct. 5, 1892
CRANE, ALBERT SEARS		
Chf. Engr., The Lake Superior Power Co, Sault Ste. Marie, Ont., Canada.	{ Jun. Assoc. M. M.	Sept. 3, 1895 May 4, 1898 May 1, 1901
CRAVEN, ALFRED		
Div. Engr., Rapid Transit R. R. Commrs., 147 Columbus Ave., New York City (Res., 53 Highland Ave., Yonkers, N. Y.)		Dec. 5, 1888
CRAWFORD, WILLIAM		
P. O. Box 345, Ottawa, Ont., Canada....		Nov. 7, 1888
CREUZBAUR, ROBERT WALTER		
Prin. Asst. Engr., Dept. of Finance, 280 Broadway, Room 52, New York City.	{ Jun. Assoc. M. M.	April 2, 1890 April 4, 1894 April 4, 1900
CROCKER, HERBERT SAMUEL		
Prin. Asst. to the Erecting Mgr., Western Div., American Bridge Co. of N. Y., 1247 Monadnock Bldg., Chicago, Ill.		Oct. 2, 1901
N. CROES, JOHN JAMES ROBERTSON (<i>Past-President.</i>)		
Cons. Engr., Morris Bldg., 68 Broad St., New York City....		Dec. 4, 1867
CROSBY, BENJAMIN LINCOLN		
Asst. Auditor, Burlington Lines, St. Joseph, Mo.	{ Jun. M.	June 2, 1880 Oct. 6, 1886
CROSBY, HORACE		
New Rochelle, N. Y.		Feb. 17, 1869
CROSBY, WILSON		
303 Hammond St., Bangor, Me.		Sept. 15, 1869
CROWELL, FOSTER		
Cons. Civ. Engr., 18 Broadway, New York City		Dec. 1, 1880
CUMMING, ADELBERT EUGENE		
Engr. and Supt. of Irrig. Constr., Ft. Belknap, Harlem, Mont..		June 6, 1894
CUMMINGS, ROBERT AUGUSTUS		
Civ. and Contr. Engr., 714 Girard Bldg., cor. Broad and Chestnut Sts., Philadelphia, Pa.	{ Jun. Assoc. M. M.	Oct. 1, 1890 May 4, 1892 June 1, 1898
CUMMINGS, WILLIAM WARREN		
Engr., The New England Gas & Coke Co., The Mass. Pipe Line Gas Co., Everett, Mass.		June 7, 1899
CUNNINGHAM, ANDREW CHASE		
Civ. Engr., U. S. N., U. S. Naval Station, New Orleans, La.	{ Assoc. M. M.	Sept. 2, 1891 Oct. 3, 1894
CUNNINGHAM, DAVID WEST		
627 West 18th St., Los Angeles, Cal.		May 7, 1873
CUNNINGHAM, JAMES HENRY		
2 Ravelston Pl., Edinburgh, Scotland.		Aug. 6, 1879
CURTIS, FAYETTE SAMUEL		
Fourth Vice-Pres., N. Y., N. H. & H. R. R. Co., South Terminal Station, Boston, Mass.		April 3, 1889
CURTIS, WALTER WHALEY		
Civ. Engr. and Contr., 1440 Marquette Bldg., Chicago, Ill.		Sept. 5, 1888

Date of
Membership.

CUSHING, EDWARD BENJAMIN			
Engr., M. of W., Southern Pacific Co., Atlantic System, 1518 Crawford St., Houston, Tex.....		Nov. 1, 1893	
CUSHING, WILLIAM CHANNING			
Supt., Eastern Div., P., F. W. & C. Ry., Allegheny City, Pa.	Jun. Assoc. M. M.	June 5, 1889 Nov. 4, 1891 May 1, 1901	
CUTSHAW, WILFRED EMORY			
City Engr., Richmond, Va.....		Mar. 4, 1891	
DABNEY, AUGUSTINE LEE			
Civ., Hydr. and San. Engr., 601 New York Life Bldg., Kansas City, Mo.....		Oct. 2, 1901	
DANFORTH, FREDERIC			
Gardiner, Me		Sept. 2, 1891	
DARLING, JOHN HENRY			
U. S. Asst. Engr., 532 W. Third St., Duluth, Minn.....		May 1, 1901	
DARLING, WILLIAM LAFAYETTE			
Chf. Engr., Northern Pacific Ry. Co., St. Paul, Minn.....		Oct. 5, 1892	
DARRACH, CHARLES GOBRECHT			
Cons. Engr., Ridley Park, Pa.....		Jan. 5, 1876	
DART, JUSTUS VINTON			
Charge of Highway Dept., City Hall, Providence, R. I.....		April 4, 1900	
DAVIES, JOHN VIPOND			
(Jacobs & Davies, Cons. Engrs.), 128 Broadway, New York City.		June 6, 1894	
DAVIS, ARTHUR POWELL			
Hydrographer, U. S. Geological Survey, Washington, D. C....	Assoc. M. M.	June 7, 1893 Oct. 4, 1899	
DAVIS, CHANDLER			
30 East 39th St., New York City.....	Jun. Assoc. M. M.	Dec. 3, 1890 Feb. 6, 1895 Oct. 4, 1899	
DAVIS, CHARLES			
County Engr., Allegheny Co., Pa., Court House, Pittsburg, Pa. (Res., 912 Western Ave., Allegheny, Pa.).....		Sept. 15, 1869	
DAVIS, CHARLES E. L. B.			
Lt.-Col., Corps of Engrs., U. S. A., Manila, Philippine Islands..		July 12, 1877	
DAVIS, CHARLES HENRY			
Cons. Engr., 25 Broad St., New York City.....		Dec. 4, 1895	
DAVIS, CHESTER BIRGE			
Cons. Engr., 10 Wall St., New York City.....		Feb. 1, 1882	
DAVIS, JOSEPH BAKER			
Prof. of Geodesy and Surv., Univ. of Michigan, 731 S. Ingalls St., Ann Arbor, Mich.....	Jun. M.	April 1, 1874 Oct. 5, 1898	
DAVIS, JOSEPH PHINEAS			
Chf. Engr., Am. Bell Telephone Co., 113 West 38th St., New York City.....		Jan. 29, 1868	
DAVIS, ROBERT BENJAMIN			
Designing Engr., Boston Elev. Ry. Co., 101 Milk St., Boston, Mass.....		July 3, 1889	

DAVISON, GEORGE STEWART		
Secty., Monongahela St. Ry. Co., Pittsburg & Birmingham Traction Co., 512 Smithfield St., Pittsburg, Pa.....	April 2, 1890	
DAWLEY, EDWIN PELEG		
Div. Engr., N. Y., N. H. & H. R. R., South Terminal Station, Boston, Mass.....	April 1, 1885	
DEAN, LUTHER		
Taunton, Mass.....	May 4, 1898	
DEANS, JOHN STERLING		
Chf. Engr., The Phœnix Bridge Co., Phœnixville, Pa.....	May 4, 1887	
DEEN, JAMES WORK		
Div. Engr., D. & R. G. R. R., Salida, Colo.....	Jan. 6, 1892	
DEFREES, MORRIS M.		
62 Ingalls Blk., Indianapolis, Ind.....	Mar. 3, 1880	
DE FUNIAK, FREDERICK		
Cons. Engr. and R. R. Expert, 204 East Chestnut St., Louisville, Ky.....	May 7, 1873	
DE LA BARRE, WILLIAM		
Engr., Agt. and Treas., St. Anthony Falls Water Power Co., Minneapolis, Minn.....	April 5, 1893	
DEL MONTE, EMILIO		
Engr. and Contr., P. O. Box 627; Office, Agmar 92, Havana, Cuba.	Dec. 4, 1895	
DENNIS, ARTHUR CRISFIELD		
Div. Engr., Constr., Western Div., C. P. Ry., 208 Main St., Winnipeg, Man., Canada.....	Dec. 4, 1901	
DENNIS, WILLIAM FRANKLIN		
(Rinehart, Dennis & Co., Contrs.), 308 E. Clay St., Richmond, Va.	Feb. 1, 1888	
DERBY, GEORGE McCLELLAN		
Maj., Corps of Engrs., U. S. A., 3232 Prytania St., New Orleans, La.....	April 1, 1896	
DERRICK, HENRY CLAY		
Houston, Halifax Co., Va.....	Oct. 5, 1887	
DE VARONA, IGNACIO MARÉA		
Engr. of Water Supply, Municipal Bldg., Brooklyn, N. Y.....	April 7, 1886	
DEVIN, GEORGE		
Care, Pardee Works, Perth Amboy, N. J.....	Sept. 7, 1887	
DEWITT, PHILIP HOFFECKER		
Asst. Engr., L. V. R. R., 315 Packer Ave., South Bethlehem, Pa.	May 5, 1897	
DEYO, SOLOMON LEFEVRE		
Chf. Engr., Rapid Transit Subway Constr. Co., 19 Park Row, New York City.....	June 6, 1888	
DIDIER, PAUL		
Asst. Chf. Engr., Constr. Dept., P. & W. Ry. Co., Allegheny, Pa.	Mar. 6, 1889	
DILLMAN, GEORGE LINCOLN		
722 Montgomery St., San Francisco, Cal.....	Mar. 4, 1891	
D'INVILLIERS, CAMILLE STANISLAUS		
1411 Sixth Ave., Altoona, Pa.....	Jan. 4, 1888	

		Date of Membership.
DOANE, EDWIN ALONZO		
Cons. Engr., Hapeville, Ga.....	June 7, 1876	
DOANE, WALTER A.		
City Civ. Engr., Meadville, Pa.....	Sept. 7, 1881	
DONOVAN, CORNELIUS		
U. S. Asst. Engr., Port Eads, La.....	Oct. 4, 1899	
DONOVAN, JOHN JOSEPH		
Gen. Supt., B. B. & E. R. R. Co.; B. B. & B. C. R. R. Co., and Blue Canyon Coal Mining Co., Whatcom Wash.....	Jun. 7, 1886 M. April 4, 1888	
DOREMUS, ABRAHAM FAIRBANKS		
State Engr., Room 601, McCormick Bldg., Salt Lake City, Utah	Oct. 4, 1893	
DORR, EDGAR SUTTON		
Chf. Engr., Sewer Div. of Street Dept., Boston, Mass.....	April 3, 1895	
DOUGLAS, BENJAMIN		
Bridge Engr., Michigan Central R. R., Detroit, Mich....	Jun. June 1, 1887 M. Jan. 2, 1890	
DOUGLAS, EDWARD MOREHOUSE		
Care, U. S. Geological Survey, Washington, D. C.....	Dec. 4, 1901	
DRAKE, ALBERT BAILEY		
164 William St., New Bedford, Mass.....	Oct. 4, 1893	
DRAKE, WILLIAM ABIAL		
Chf. Engr. and Gen. Supt., S. F. P. & P. Ry., Prescott, Ariz...	Dec. 5, 1883	
DU BOIS, AUGUSTUS JAY		
Prof. of Civ. Eng., Sheffield Scientific School, New Haven, Conn.....	Jun. July 7, 1875 M. Oct. 5, 1892	
DUDLEY, CHARLES BENJAMIN		
Chemist, Penna. R. R. Co., Drawer 334, Altoona, Pa.....	Mar. 2, 1892	
DUGGAN, GEORGE HERRICK		
Chf. Engr., Dominion Bridge Co., Ltd., Montreal, Que., Canada.	Oct. 2, 1895	
DUN, JAMES		
Chf. Engr., A., T. & S. F. Ry. System, Room 1602, Great Northern Bldg., Chicago, Ill.....	June 7, 1876	
DUNCKLEE, JOHN BUTLER		
Civ. and Cons. Engr., 35 Fairview Ave., South Orange, N. J...	April 2, 1873	
DUNHAM, HERBERT FRANKLIN		
St. Paul Bldg., 220 Broadway, New York City.....	Oct. 1, 1890	
DUNLAP, DE CLERMONT		
5535 Monroe Ave., Chicago, Ill	Jan. 4, 1888	
DUNN, DANIEL BURKE		
Chf. Engr., Macon, Dublin & Savannah R. R. Co., Vidalia, Ga..	Dec. 2, 1891	
DURYEA, EDWIN, Jr.		
1 Broadway, New York City.....	Jun. Feb. 2, 1887 Assoc. M. Sept. 4, 1895 M. Feb. 2, 1898	
EARL, GEORGE GOODELL		
Gen. Supt., Sewerage and Water Board, New Orleans, La.....	Jun. May 7, 1890 Assoc. M. Dec. 2, 1891 M. April 4, 1894	
EARLEY, JOHN EDWIN		
Cons. Civ. Engr., Calle Ortega No. 28, City of Mexico, Mexico.	April 5, 1876	

EASBY, MARMADUKE WARD				
Cons. and Const. Engr., 909 Crozer Bldg., 1420 Chestnut St., Philadelphia, Pa.		Assoc. M. M.	Nov. 4, 1891 Dec. 1, 1897	
EATON, FREDERICK				
460 West Lake Ave., Los Angeles, Cal.			May 5, 1886	
ECKART, WILLIAM ROBERTS				
Cons. Engr., Room 4, Nevada Blk., San Francisco, Cal.			Jan. 5, 1881	
ECKERT, EDWARD WILLIAM				
452 West 153d St., New York City			Feb. 3, 1886	
EDES, WILLIAM CUSHING				
Asst. Engr., Southern Pacific Co., 4 Montgomery St., San Francisco, Cal.		Jun. M.	Sept. 1, 1886 Nov. 4, 1896	
EDWARDS, HARRY WINTER				
Republic, Wash.			June 4, 1890	
EDWARDS, JAMES HARVEY				
Asst. Chf. Engr., American Bridge Co., Oxford, Che- nango Co., N. Y.		Jun. Assoc. M. M.	May 31, 1892 May 2, 1894 May 4, 1898	
EDWARDS, NATHANIEL MARSH				
Civ. and Hydr. Engr., 814 College Ave., Appleton, Wis.			June 3, 1874	
ELDRIDGE, ARCHIBALD RONALDSON				
Office of Chf. Engr., C., B. & Q. R. R., 209 Adams St., Chicago, Ill.			Oct. 2, 1901	
ELLIOTT, CHARLES GLEASON				
80 Baldwin Blk., Indianapolis, Ind.			Sept. 3, 1890	
ELLIS, GEORGE EZRA				
Signal Engr., Standard Signal Co., Troy, N. Y.		Jun. Assoc. M. M.	Mar. 2, 1897 Mar. 7, 1900 Dec. 4, 1901	
ELLIS, JOHN WALDO				
Cons. Engr., Woonsocket, R. I.			July 3, 1895	
ELLIS, SAMUEL CLARENCE				
1750 Beacon St., Brookline, Mass.			Aug. 7, 1872	
ELMER, HOWARD NIXON				
Mgr., Chicago Office, The Trenton Iron Co., 1114 Monadnock Blk., Chicago, Ill.			April 7, 1886	
ELWELL, CHARLES CLEMENT				
Supt. of the Norwich Div., N. Y., N. H. & H. R. R., Norwich, Conn.			July 1, 1891	
ELY, THEODORE NEWEL				
Chf. of Motive Power, Penna. R. R., Broad St. Station, Philadelphia, Pa.			Mar. 2, 1881	
EMIGH, JOHN H.				
City Engr., North Adams, Mass.			April 3, 1901	
ENDICOTT, MORDECAI THOMAS (<i>Director.</i>)				
Rear-Admiral and C. E., U. S. Navy; Chief of Bureau of Yards and Docks, U. S. Navy Dept., Washington, D. C.			April 1, 1877	
ENGLE, ROBERT L.				
1530 Westminster Ave., Cincinnati, Ohio			Sept. 7, 1881	

		Date of Membership.
ERLANDSEN, OSCAR	{ Jun. Asst. Engr. in Chg., East River Bridge No. 4, Park Row Bldg., New York City.....	May 1, 1889 Dec. 2, 1891 Oct. 7, 1896
ERNST, OSWALD HERBERT	Lt.-Col., Corps of Engrs., U. S. A., 1637 Indiana Ave., Chicago, Ill.....	July 4, 1888
EVANS, GEORGE EDWIN	Civ. and Hydr. Engr., 95 Milk St., Boston, Mass.	May 2, 1888
EVANS, LOUIS HYDE	Contr. Engr., 7 East 42d St., New York City	July 3, 1889
EVANS, RICHARD	Room 1, Town Hall, Jamaica, Queens Co., N. Y.....	June 7, 1893
EWING, WILLIAM BION	{ Jun. City Engr., La Grange, Ill..	April 3, 1889 Feb. 3, 1892 Nov. 2, 1898
EWING, WILLIAM BION	{ Assoc. M. M.	
FAIRLEIGH, JAMES ANDREW	With Western Cement Co., Louisville, Ky.....	Sept. 2, 1891
FANNING, JOHN THOMAS	Cons. Engr., 330 Hennepin Ave., Minneapolis, Minn.....	Aug. 7, 1872
FARLEY, GODFREY PEARSON	Gen. Mgr. and Chf. Engr., Wiscasset, Waterville & Farmington R. R. Co., Wiscasset, Me.....	June 6, 1900
FARLEY, JOHN MOYER	{ Jun. Cons. Engr., White Plains, N. Y.....	Dec. 5, 1888 July 1, 1891 Sept. 1, 1897
FARNUM, HENRY HARRISON	{ Assoc. M. M.	
FARNUM, HENRY HARRISON	Chf. Engr. of Sewers, Borongh of the Bronx, Third Ave. and 177th St., New York City.....	July 1, 1891
FARRAR, HARTWELL PRENTICE	Civ. Engr., M. & O. R. R., Jackson, Tenn.....	Nov. 1, 1893
FEHR, HARRISON ROBERT	Pres. and Chf. Engr., Trenton & New Brunswick R. R. Co., Easton, Pa.....	Oct. 5, 1898
FELT, CHARLES FREDERICK WILSON	Chf. Engr., Gulf, Colorado & Santa Fé Ry., Galveston, Tex....	Mar. 3, 1897
FELTON, BURTON ROGERS	{ Assoc. M. Civ. and Hydr. Engr., 1121 Tremont Bldg., Boston, Mass.....	April 4, 1894 Oct. 7, 1896
FELTON, HERBERT CLARK	Supt., Del. River Ferry Co. of N. J., of P. & R. Ry. System, Camden, N. J.....	June 1, 1887
FELTON, SAMUEL MORSE	Pres., Chicago & Alton Ry. Co., Chicago, Ill.....	Jan. 4, 1882
FERGUSON, HARDY SMITH	Chf. Engr., Great Northern Paper Co., Millinocket, Me.....	Mar. 3, 1897 May 1, 1901
FERGUSON, JOHN WILLIAM	{ Jun. Builder and Gen. Contr., 253 Broadway, New York City.	Feb. 2, 1881 Feb. 2, 1887
FERGUSON, JOHN WILLIAM	{ M.	

MEMBERS.

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Date of
Membership

FERRY, CHARLES ADDISON				
With A. B. Hill, Cons. Civ. Engr., 24 Edgewood Ave., New Haven, Conn.....		Jun. M.	May 4, 1881 Jan. 2, 1889	
FIEBEGER, GUSTAVE JOSEPH				
Prof. of Eng., West Point, N. Y.....			Oct. 2, 1895	
FIELD, GEORGE SPENCER				
888 Ellicott Sq., Buffalo, N. Y.....			April 7, 1880	
FIELD, WILLIAM PIERSON				
976 Broad St., Newark, N. J.....		Jun. M.	Dec. 7, 1887 Mar. 6, 1901	
FIELDS, SAMUEL JAMES				
Chf. Engr., Pan-American Exposition Co., 632 Ellicott St., Buffalo, N. Y.....			Mar. 5, 1884	
FILLEY, HIEL HAMILTON				
Cons. Engr., 2816 Campbell St., Kansas City, Mo.....			Jan. 3, 1883	
FINK, RUDOLPH				
Crescent Hill, Ky.....			Sept. 21, 1870	
FIRMSTONE, FRANK				
Easton, Pa.....			Aug. 7, 1878	
FISHER, CLARK				
Fisher Rail Joint Works, Trenton, N. J.....			Oct. 19, 1870	
FISHER, EDWIN AUGUSTUS				
City Engr., 16 Reynolds St., Rochester, N. Y.....			July 4, 1888	
FISHER, FRANCIS DAVIS				
Engr., The Degnon-McLean Contr. Co., Rapid Transit Subway, Worth and Elm Sts., New York City.....			May 2, 1888	
FISHER, JANON				
Ruxton, Md.....		Assoc. M. M.	May 4, 1892 Jan. 5, 1898	
FISK, WALTER LESLIE				
Maj., Corps of Engrs., U. S. A., 33 Campau Bldg., Detroit, Mich.	April 1, 1896			
FITCH, ASA BETTS				
Lessee, The Graphic Mines & Smelting Works, Magdalena, N. Mex.....			Mar. 5, 1884	
FITCH, CHARLES HALL				
Topographer, U. S. Geological Survey, 3062 Q St., N. W., Washington, D. C.....			June 5, 1901	
FITCH, CHARLES LINCOLN				
Supt. of Motive Power, St. Louis & Suburban Ry. System, St. Louis, Mo.....			Oct. 2, 1901	
N. FITZGERALD, DESMOND (<i>Past-President.</i>)				
Dept. Engr., Met. Water Board, 1 Ashburton Pl., Boston, Mass.	Sept. 3, 1884			
FITZGERALD, JOHN LELAND				
Cons. Engr., Sewers and Water-Works, 175 Jay St., Schenectady, N. Y.....			Jan. 2, 1889	
FLAD, EDWARD				
Water Commr., City Hall, St. Louis, Mo.....		Jun. M.	Jan. 7, 1885 Feb. 1, 1888	
FLAGG, JOSIAH FOSTER				
Las Vegas, N. Mex.....			Oct. 7, 1874	

Date of
Membership.

FLEMING, Sir SANDFORD				
Ottawa, Ont., Canada.....				Sept. 18, 1872
FOLLETT, WILLIAM W.				
U. S. Cons. Engr., International Boundary Comm., United States and Mexico, El Paso, Tex.....			July 5, 1893	
FOLWELL, AMORY PRESCOTT	Jun.		Feb. 5, 1890	
Hydr. and Municipal Engr., Easton, Pa.....	{ Assoc. M. M.		June 7, 1893 Nov. 3, 1897	
FOOTE, ARTHUR DEWINT				
Supt., North Star Mines Co., Grass Valley, Cal.....			May 7, 1884	
FORCE, CYRUS GILDERSLEEVE				
Cons. Civ. Engr., Flanders, Morris Co., N. J.....			Feb. 6, 1878	
FORSYTH, ROBERT				
Cons. Engr., 1143 Rookery, Chicago, Ill.....			May 12, 1875	
FOSTER, WILBUR FISK				
Engr. and Contr., 3 Berry Blk., Nashville, Tenn.....			May 7, 1873	
FOUQUET, JOHN DOUGLAS				
Draftsman, Architectural Dept., Room 505, Grand Central Station, N. Y. C. & H. R. R., New York City.....			June 3, 1885	
FOWLER, CHARLES EVAN	Jun.		May 7, 1890	
Pres. and Chf. Engr., Puget Sound Bridge & Dredging Co., 510 Pioneer Bldg., Seattle, Wash..	{ Assoc. M. M.		Dec. 6, 1893 May 3, 1898	
FOX, STEPHENSON WATERS				
Supv. Engr. to Missouri River Comm., Jefferson City, Mo ..	{ Jun. M.		July 7, 1880 Oct. 6, 1886	
FRANCIS, CHARLES				
8 Masonic Temple, Davenport, Iowa			May 4, 1892	
FRANCIS, GEORGE BLINN				
Chf. Engr., Union R R. and Rhode Island Suburban Ry., Providence, R. I.....	{ Jun. M.		Sept. 5, 1883 Nov. 7, 1888	
FRANCIS, HENRY NEWTON				
Arlington, R. I.....	{ Jun. M.		Mar. 1, 1876 Nov. 7, 1888	
FRANK, GEORGE WILLIAM				
Engr. in Chg., Yadkin River Hydr. Development, New London, N. C.....			Feb. 1, 1899	
FRANKLIN, WILLIAM BUEL				
144 Washington St., Hartford, Conn.....			April 1, 1874	
FRAZIER, JAMES LEWIS (<i>Director</i>)				
Gen. Supt., Toledo, St. Louis & Western R. R. Co., Frankfort, Ind.....			Sept. 1, 1880	
N. FREEMAN, JOHN RIPLEY (<i>Vice-President</i>)				
Consulting Engineer; also Pres. and Treas., Mfrs.' Rhode Island and Mechanics' Insurance Cos., 812 Banigan Bldg., Providence, R. I..	{ Jun. M.		June 7, 1880 April 3, 1889	
FRENCH, ALEXIS HENRY				
Town Engr., Town Hall, Brookline, Mass.; also of firm of French & Bryant, Civ. Engrs., 334 Washington St., Brookline, Mass., and 4 State St., Boston, Mass.....			June 6, 1894	

FRENCH, ALFRED WILLARD				
Pres., The French Oil Mill Machinery Co., Piqua, Ohio.....		May	2, 1900	
FRENCH, JAMES BENTON		Jun.	Feb. 6, 1889	
Bridge Engr., Atlantic Ave. Impvt., Long Island R. { Assoc. M. R., 44 Court St., Brooklyn, N. Y.	M.	Feb. 7, 1894 Nov. 2, 1898		
FREW, ARCHIBALD SMITH				
Chf. Engr., Chillagoe Ry. & Mines Co., Ltd., Mareeba, Queensland, Australia.....		Oct.	3, 1900	
FRINK, ELLIS ALEXANDER				
Vice-Pres. and Chf. Engr., Structural Iron & Steel Co., Bush and Wicomico Sts. (Res., 2326 Guilford Ave.), Baltimore, Md.	{ Assoc. M. M.	June 6, 1900 Dec. 4, 1901		
FRITCH, LOUIS CHARLTON				
Supt., B. & O. S. W. Ry., Miss. Div., Washington, Ind.....		Oct.	3, 1900	
FRITZ, JOHN	{ M.	July 5, 1893		
Bethlehem, Pa.....	Hon. M.	Sept. 5, 1899		
FRIZELL, JOSEPH PALMER				
Civ. Engr., Hydr. Expert, 60 Congress St., Boston, Mass.....		Jan.	3, 1883	
FRYE, ALBERT IRVIN				
Bend, Ore.....		Dec.	2, 1896	
N. FTELEY, ALPHONSE (<i>Past-President.</i>)				
14 West 131st St., New York City.....		Jan.	5, 1876	
FUERTES, ESTEVAN ANTONIO				
Director and Dean of Faculty, College of Civil Engineering of Cornell Univ., Ithaca, N. Y.....		Feb.	17, 1869	
FUERTES, JAMES HILLHOUSE	{ Jun.	May 2, 1888		
Civ. and San. Engr., 120 Liberty St., New York City... { M.	M.	Feb. 6, 1895		
FULLER, FRANK LOUIS	{ Jun.	April 4, 1883		
12 Pearl St., Boston, Mass..... { M.	M.	April 4, 1888		
FULLER, FRANKLIN IDE				
Gen. Mgr., Portland Ry. Co., cor. First and Washington Sts., Portland, Ore		Jan.	6, 1886	
FULLER, WILLIAM BARNARD	{ Jun.	June 3, 1885		
Hydr. and San. Engr., 100 William St., New York City.. { M.	M.	May 1, 1895		
FULTON, JOHN ADDISON				
401 Western Union Bldg., Chicago, Ill.....		May	4, 1887	
FURBER, WILLIAM COPELAND				
Archt. and Cons. Engr., 421 Chestnut St., Philadelphia, Pa....		May	2, 1899	
GADSDEN, GEORGE MORRALL				
Director of Public Works, Savannah, Ga.....		May	4, 1898	
GAHAGAN, WALTER HAMER				
Engr. and Gen. Foreman for Contrs., in Chg. { Jun. Caisson Work, N. Y. Tower Foundation, New { Assoc. M. East River Bridge, 189 Montague St., Brooklyn, { M. N. Y.	Jun. Assoc. M. M.	Sept. 5, 1888 July 1, 1891 April 3, 1901		
GAMBLE, FRANCIS CLARKE				
Public Works Engr. and Insp. of Dykes, Province of British Columbia, Victoria, B. C., Canada.....		April 1, 1891		

		Date of Membership.
GARDINER, EDMUND LEBRETON		
Passaic, N. J.	June 7, 1882	
GARDNER, GEORGE CLINTON		
Beech St., Richmond Hill, Queen's Borough, New York City....	Nov. 3, 1875	
GARDNER, MARTIN LUTHER		
Asst. Engr., P. R. R. Co., Jersey City, N. J. (Res., { Assoc. M. 58 Elizabeth Ave., Newark, N. J.)..... { M.	Sept. 2, 1891 Mar. 4, 1896	
GARRISON, EVERETT		
Chf. Engr., Newburgh, Dutchess & Conn. R. R., Newburgh, N.Y.	Mar. 7, 1894	
GATCHELL, GEORGE SAMUEL		
Mgr., Buffalo Elevating Co., 68 Board of Trade, Buffalo, N. Y..	May 7, 1884	
GATES, CHRISTOPHER LAWRENCE	{ Jun.	Dec. 4, 1878
416 Irving St., Toledo, Ohio.....	{ M.	Sept. 5, 1883
GATES, HORACE DELPHOS		
Asst. Engr., 311 Lyon St., San Francisco, Cal.....	Mar. 7, 1883	
GAY, CHARLES WEBSTER		
25 Exchange St., Lynn, Mass.....	May 6, 1891	
GAY, MARTIN	{ Jun.	June 4, 1884
Asst. Engr., Dept. of Bridges, New York City.....	{ M.	June 5, 1889
GAYLER, CARL		
Bridge Engr., Street Dept., City Hall, St. Louis, Mo.....	Sept. 3, 1884	
GAYOL, ROBERTO		
Chf. Engr. and Director of Drainage of the City of Mexico; Mem. of Board of Health; Chf. Engr., Rio-Frio Ry., City of Mexico, Mexico.....	Mar. 2, 1892	
GEDDES, EDMUND BURNS		
U. S. Asst. Engr., Natchez, Miss.....	Mar. 2, 1898	
GEDDES, JAMES KENNON		
Receiver and Gen. Mgr., B., Z. & C. Ry. Co., Zanesville, Ohio..	Jan. 2, 1890	
GEER, HARVEY MOSHER		
Ballston, N. Y.....	June 6, 1894	
GELETTE, WILLIAM DURFEE		
Asst. Engr., S. P. Co., 4 Montgomery St., Room 64, San Fran- cisco, Cal.....	April 1, 1885	
GEMMELL, ROBERT CAMPBELL		
Engr., Mexican Mining Syndicate, Mazapil, Zac., { Assoc. M. Mexico	Oct. 5, 1892 Dec. 4, 1895	
GERBER, EMIL		
Asst. to Pres., American Bridge Co., Pencoyd, Pa.....	Feb. 1, 1888	
GIBBS, CHARLES WINGATE		
Civ. and Min. Engr., Telluride, Colo.....	Jan. 2, 1889	
GIBBS, GEORGE		
Cons. Engr., Rapid Transit Subway Constr. Co., Park Row Bldg., New York City.....	Mar. 6, 1895	
GIFFORD, GEORGE E.		
Eastern Representative, The King Bridge Co., 120 { Assoc. M. Liberty St., New York City.....	Oct. 7, 1891 Jan. 1, 1896	

MEMBERS.

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Date of
Membership.

GILES, ROBERT				
Prin. Asst. Engr., U. S. Engr. Office, San Juan, Porto Rico.....		May	6, 1891	
GILLETTE, EDWARD				
Asst. Supt., Wyoming Div., B. & M. R. R. Co., Sheridan, Wyo.	May	6, 1891		
GILLETT, LEWIS SINGER				
Pres., Electric Steel Elevator Co.; Pres., Minnesota Malleable Iron Co., Minneapolis, Minn.....	June	7, 1899		
GLADDING, HENRY HOLBROOK	{ Jun.	July 1, 1885		
Asst. City Engr., 30 Stanley St., New Haven, Conn.....	{ M.	Jan. 4, 1888		
GLASGOW, ARTHUR GRAHAM				
(Humphreys & Glasgow), 38 Victoria St., London, S. W., Eng- land.....		Jan. 3, 1900		
GOAD, CHARLES EDWARD				
15 Wellington St. West, Toronto, Ont., Canada (also 185 St. James St., Montreal, Que., Canada, and 53 New Broad St., London, E. C., England).....		Sept. 7, 1881		
GOING, ALVAH SEYMOUR	{ Assoc. M.	May 4, 1892		
Hillside Ave. and Cook St., Victoria, B. C., Canada. { M.		June 7, 1899		
R. GOLDMARK, HENRY				
Engr. and Supt., Geo. B. Swift Co., Gen. Contrs., Chicago, Ill.; Address, 126 West Washington St., Indianapolis, Ind.....	{ Jun. M.	May 7, 1884 June 6, 1888		
GOODALE, LOOMIS FARRINGTON				
Chf. Engr., Missouri Lines of Chicago, Burlington & Quincy Ry. Co., Room 610, Globe Democrat Bldg., St. Louis, Mo...		Nov. 7, 1900		
GOODRICH, WILBUR FRANCIS				
10 Gibbens St., Somerville, Mass.....		May 4, 1887		
GOULD, EDWARD SHERMAN				
Cons. Engr., Yonkers, N. Y.....		Nov. 4, 1885		
GOULD, WILLIAM TILLOTSON				
Res. Engr., Texas Central R. R., Waco, Tex.....		Jan. 2, 1890		
GOWEN, CHARLES SEWALL				
Engr., New Croton Dam, Ossining, N. Y.....		Mar. 7, 1888		
GRAFTON, CHARLES EDWIN				
Care, B. & O. R. R., Akron, Ohio.....		Jan. 1, 1896		
GRAHAM, CHARLES HALLETT				
Engr. in Chg. of Sewers, Borough of the Bronx, Bronx Municipi- pal Bldg., 177th St. and Third Ave., New York City.....		Sept. 7, 1887		
GRAHAM, JOSEPH MARSHALL				
Chf. Engr., B. & O. R. R., Baltimore, Md.....		April 4, 1900		
GRANT, EMERSON WARREN				
Res. Engr., A., T. & S. F. Ry., East Las Vegas, N. Mex.....		Dec. 4, 1889		
GRANT, JUSTUS HERBERT				
Commr. of Public Works, City Hall, Rochester, N. Y.....		Mar. 2, 1892		
GRAVES, EDWIN DWIGHT				
Chf. Engr., Conn. Riv. Bridge and Highway Dist. Comm., 650 Main St., Hartford, Conn.....	{ Assoc. M. M.	Jan. 2, 1895 Dec. 2, 1896		

		Date of Membership.
GRAY, GEORGE EDWARD	{ M.	June 2, 1873
Cons. Engr., 1115 Bush St., San Francisco, Cal....	{ Hon. M.	June 5, 1894
GRAY, JOHN HENRY		
Watkins, N. Y.....		Oct. 2, 1895
GRAY, SAMUEL MERRILL		
Cons. Engr., Providence, R. I.....		May 15, 1872
GREEN, BERNARD LINCOLN		
Secy., The Osborn Engineering Co., Osborn Bldg., Cleveland, Ohio.....		April 3, 1901
GREEN, BERNARD RICHARDSON		
Supt., Building and Grounds, Library of Congress, Washington, D. C.		Oct. 2, 1889
GREENE, BENJAMIN DWIGHT		
Stamford, Conn.....		Nov. 4, 1885
GREENE, CHARLES EZRA		
Prof. of Civ. Eng. and Dean of Dept. of Eng., Univ. of Michigan, Ann Arbor, Mich..		Jan. 4, 1882
GREENE, DAVID MAXSON		
Cons. Engr., 41 First St., Troy, N. Y.....		May 20, 1868
GREENE, EDWARD APPLETON		
Cons. Engr., 10 Wall St., New York City		July 4, 1888
GREENE, FRANCIS VINTON		
11 Broadway, New York City.....		June 3, 1885
GREENE, GEORGE SEARS, Jr.		
Cons. Engr., 11 Broadway, New York City.....		Dec. 4, 1867
GREENE, JOSEPH NORTON		
Chf. Engr., Penobscot Central Ry., Bangor, Me.....		Oct. 5, 1887
N. GREINER, JOHN EDWIN		
Engr. of Bridges and Bldgs, B. & O. R. R., Mt. Royal Station, Baltimore, Md		June 4, 1890
GRESHAM, ROBERT HALL		
Locating Engr., C. O. & G. Ry., 112 Agarita Ave., San Antonio, Tex.....		May 4, 1898
GRIFFIN, EUGENE		
Gen. Electric Co., 44 Broad St., New York City.....		June 7, 1899
GRIGGS, JULIAN		
Chf. Engr., Dept. of Public Impvts., Columbus, Ohio.....		Oct. 4, 1899
GRIMM, CARL ROBERT		
103 Main St., Mt. Vernon, Ohio.....		June 4, 1890
GRIMSHAW, JAMES WALTER		
Asst. Engr., Public Works Dept., Sydney, New South Wales; Address, Australian Club, Sydney, New South Wales, Australia.		Nov. 7, 1888
GRISWOLD, FRANK LOOMIS		
Cons. Engr., Cruz del Eje, Cordoba, Argentine Republic. (<i>via</i> Europe)		May 2, 1883
GRUNSKY, CARL EWALD		
City Engr., San Francisco, Cal.....		Oct. 5, 1898

Date of
Membership.

GUILD, JOSEPHUS CONN			
Chattanooga, Tenn.....		June 1, 1898	
GUNNELL, WILLIAM COVINGTON			
600 Twentieth St., Washington, D. C.....		Feb. 7, 1877	
GUPPY, BENJAMIN WILDER	{ Jun.	June 19, 1891	
Bridge Engr., Maine Central R. R., Portland, Me....	{ Assoc. M.	Oct. 3, 1894	
(M.)	{ M.	Feb. 6, 1901	
GUTHRIE, EDWARD BUCKINGHAM	{ Assoc.	Sept. 3, 1884	
Chf. Engr., Grade Crossing Comm., 436 Ellicott Sq.	{ M.	Oct. 5, 1887	
(Res., 158 North Pearl St.), Buffalo, N. Y.....			
HAGUE, CHARLES ARTHUR			
Cons. Engr., 39 Cortlandt St., New York City.....		Feb. 3, 1892	
HAIGHT, STEPHEN SAMUEL			
Civ. Engr. and City Surv., 2085 Daly Ave., West Farms, New			
York City.....		June 1, 1881	
HAINES, CASPAR WISTAR	{ Jun.	Feb. 2, 1876	
Mexican Vice-Consul, 26 South 15th St., Philadelphia, Pa.	{ M.	Oct. 7, 1891	
HAINES, HENRY STEVENS (<i>Vice-President.</i>)			
The Engineers' Club, 374 Fifth Ave., New York City.....		Nov. 2, 1887	
HAINS, PETER CONOVER			
Col., Corps of Engrs., U. S. A., 812 St. Paul St., Baltimore, Md.		April 2, 1890	
HALE, RICHARD AUGUSTUS	{ Jun.	Feb. 6, 1884	
Prin. Asst. Engr., Essex Company, Lawrence, Mass ...	{ M.	July 1, 1891	
HALL, BENJAMIN MORTIMER			
Hydrographer, U. S. Geological Survey; Senior Mem. of the			
firm of Hall Brothers, Civ. and Mech. Engrs., 409 Temple			
Court, Atlanta, Ga.....		Feb. 6, 1901	
HALL, JULIEN ASTIN			
Cons. Engr., Bachelors Hall, Va.....		June 5, 1889	
N. HALL, WILLIAM HAMMOND			
Cons. Engr., 324 Haight St., San Francisco, Cal.....		Jan. 2, 1884	
HALL, WILLIAM McLAURINE			
Asst. Engr., U. S. Engrs., U. S. Engr. Office, Parkersburg, W. Va.		Dec. 6, 1893	
HAMBLETON, FRANCIS HENRY			
Cons. Engr., 8 South St., Baltimore, Md.....		Mar. 5, 1873	
HAMILTON, WILLIAM GASTON			
105 East 21st St., New York City.....		Oct. 7, 1868	
HAMLIN, GEORGE HERBERT			
Orono, Me.....		July 3, 1895	
HAMMATT, EDWARD AUGUSTUS WHITE			
Civ. and Hydr. Engr., 53 State St., Boston, Mass.....		June 5, 1901	
HANDY, EDWARD ADINO			
Chf. Engr., L. S. & M. S. Ry., and L. E. & W. R. R., Cleveland,			
Ohio.....		Jan. 2, 1889	
HANNAFORD, EDMUND PHILLIPS			
2573 Catherine St., Montreal, Que., Canada.....		Sept. 18, 1872	

		Date of Membership.
HANSEL, CHARLES	100 William St., New York City	Oct. 3, 1894
HARDEE, WILLIAM JOSEPH	City Engr., Room 19, City Hall, New Orleans, La.....	May 6, 1896
HARDING, GEORGE EDWARD	Civ. Engr. and Archt., 253 Broadway, New York City.....	Mar. 3, 1875
HARDING, HENRY	Civ. and Hydr. Engr., Hartland (Fourcorners), Vt.....	May 7, 1873
HARDY, GEORGE RICHARDSON	Asst. Engr. of Constr., N. Y., N. H. & H. R. R., Forest Hills, Mass.	Nov. 7, 1888
HARING, JAMES SMITH	Crafton, Allegheny Co., Pa	Nov. 4, 1891
HARLEY, ALFRED FRANCIS	127a Highbury New Park, London, England.....	Dec. 7, 1898
HARLOW, GEORGE RICHARDSON	Purchasing Agt., Pennsylvania Water Co., 701 Wood St., Wil- kinsburg, Pa	Nov. 1, 1899
HARLOW, JAMES HAYWARD	Pres. and Chf. Engr., Pennsylvania Water Co., 701 Wood St., Wilkinsburg, Pa.; P. O. Address, Station D, Pittsburg, Pa..	Mar. 4, 1874
HARRINGTON, EPHRAIM	Civ. and Cons. Engr., 60 State St., Boston, Mass.....	Mar. 3, 1897
HARRIS, ELMO GOLIGHTLY	Asst. Prof. of Civ. Eng., Univ. of Pennsylvania, Philadelphia, Pa.....	Oct. 2, 1901
HARRIS, WILLIAM POND	Mfr., Johnson City, Tenn.....	June 1, 1881
HARRISON, CHARLES LEWIS	Chf. Engr., Denver Union Water Co., Denver, Colo.....	Mar. 2, 1898
HARRISON, EDLOW WINGATE	Civ. and Cons. Engr.; Cons. Engr., Jersey City Water Supply Co., 15 Exchange Pl., Jersey City, N. J.....	June 3, 1885
HARROD, BENJAMIN MORGAN (<i>Past-President.</i>)	Room 20, City Hall, New Orleans, La.....	April 4, 1877
HARROUN, PHILIP EMBURY	Hydr. and Irrig. Engr., Albuquerque, N. Mex.....	Mar. 7, 1900
HARTRICK, EDWARD MACAULAY	U. S. Asst. Engr. in Chg., River and Harbor Impvts., Gal- veston, Tex.....	Feb. 1, 1899
HARTS, WILLIAM WRIGHT	Capt., Corps of Engrs., U. S. A., Manila, Philip- pine Islands.....	Oct. 2, 1895 April 6, 1898
HASBROUCK, CHARLES ALFRED	Asst. to Vice-Pres., American Bridge Co., 1315 Monad- nock Blk., Chicago, Ill.....	Feb. 3, 1892 Dec. 5, 1894
HASIE, MONTAGUE SYLVESTER	Contr. Mgr., American Bridge Co. of New York, for Texas, Arkansas and Louisiana, Dallas, Tex.....	Feb. 3, 1897

HASKELL, EUGENE ELWIN			
Asst. Engr., U. S. Lake Survey, Campau Bldg., Detroit, Mich.	Sept. 7, 1898		
HASKINS, WILLIAM JEWETT			
Chf. Engr. of Sewers, New Rochelle, N. Y.; 32 Broadway, New York City.....	{ Jun. Mar. 7, 1883 M. Dec. 1, 1886		
HASWELL, CHARLES HAYNES			
Civ. and Cons. Engr., 324 West 78th St., New York City.....	Jan. 29, 1868		
HATCH, FREDERICK THOMAS			
Supt., T. H. & L. and L. & T. Rys., Logansport, Ind.....	Dec. 4, 1889		
HATTON, THOMAS CHALKLEY			
Cons. Engr., Wilmington, Del.....	Mar. 6, 1895		
HAUPT, LEWIS MUHLENBERG			
Cons. Civ. Engr., 107 North 35th St., Philadelphia, Pa.....	June 6, 1888		
HAVEN, WILLIAM APPLETON			
Inspecting Engr., Erie R.R., Room 10, Erie R. R. Depot, Buffalo, N. Y.....	Mar. 5, 1873		
HAVILAND, ARTHUR			
Law Dept., N. Y. C. & H. R. R. R., Grand Central Station, New York City.....	{ Jun. Jan. 4, 1882 M. Jan. 4, 1888		
HAWKS, JAMES DUDLEY			
Pres., Detroit & Mackinac Ry., Detroit, Ypsilanti, Ann Arbor & Jackson Ry., Grand Rapids, Grand Haven & Muskegon Ry., American Power Co., Detroit, Mich.....	Dec. 3, 1884		
HAWLEY, JOHN BLACKSTOCK			
City Engr., Fort Worth, Tex.....	{ Assoc. M. May 1, 1895 M. Oct. 5, 1898		
HAYDEN, WILLIAM WALLACE			
Poplar Street Depot, I. C. R. R., Memphis, Tenn.....	Nov. 6, 1895		
HAYES, EDMUND			
Ellicott Sq., Buffalo, N. Y.....	{ Jun. Mar. 6, 1878 M. Mar. 5, 1884		
HAYES, EDWARD			
Chf. Engr., Public Impvt. Comm., Cohoes, N. Y.....	June 5, 1901		
HAYES, HENRY WILDE			
Asst. Engr., B. & M. R. R., Boston, Mass.....	{ Assoc. M. Mar. 2, 1898 M. May 1, 1901		
HAYES, RICHARD SOMERS			
32 Nassau St. (Res., 30 East 51st St.), New York City	Sept. 6, 1882		
HAYES, STANLEY WOLCOTT			
Engr. of Track Elevation, D., L. & W. R. R., Newark, N.J.; P. O. Address, 220 West 57th St., New York City.....	June 6, 1900		
HAYS, JOHN WILLIS			
3 South Adams St., Petersburg, Va.....	June 5, 1901		
HAYT, STEPHEN THURSTON, Jr.			
Asst. Engr., Pennsylvania Div., N. Y. C. & H. R. R., Jersey Shore, Pa.....	Mar. 3, 1897		
HAZARD, SCHUYLER			
24 Westchester Ave., White Plains, N. Y.....	Oct. 5, 1898		
HAZELTON, CHARLES WILLIAM			
Engr. and Treas., Turners Falls Co. (Water Power), Turners Falls, Mass.....	Jan. 7, 1891		

		Date of Membership.
R. HAZEN, ALLEN	{ Assoc. M.	June 3, 1896
Cons. Engr., St. Paul Bldg., New York City	{ M.	Mar. 6, 1900
HAZLEHURST, GEORGE BLAGDEN		
1215 N. Charles St., Baltimore, Md.		Feb. 1, 1888
HAZLEHURST, JAMES NISEET		
Mobile, Ala.		Oct. 4, 1899
HEALD, SIMPSON CLARK		
48 Congress St., Boston, Mass.		Nov. 4, 1885
HEALY, JOHN FRANCIS	{ Jun.	Jan. 2, 1890
Chf. Engr., Davis Coal & Coke Co., Thomas, W. Va.	{ Assoc. M. M.	June 3, 1891 Nov. 1, 1899
HEDRICK, IRA GRANT	{ Jun.	Oct. 3, 1893
(Waddell & Hedrick, Cons. Engrs.) 660 Gibraltar Bldg., Kansas City, Mo.	{ Assoc. M. M.	June 2, 1897 Nov. 7, 1900
HEGEMAN, WILLIAM WALLACE		
Cons. Engr., 210 Bay St. (East), Savannah, Ga.		Feb. 6, 1884
HENDERER, WILLIAM OSWALD		
Vice-Pres., The Osborn Engineering Co., Osborn Bldg., Cleveland, Ohio.		April 3, 1901
HENDERSON, JOHN BAILLIE		
Govt. Hydr. Engr., Brisbane, Queensland, Australia.		June 4, 1890
HENDRICK, CALVIN WHEELER		
Div. Engr., Rapid Transit Ry. Comm., 13 Astor Pl., New York City.		Nov. 7, 1900
HENNY, DAVID CHRISTIAAN		
204 Front St., San Francisco, Cal.		Sept. 7, 1887
HENRY, DANIEL FARRAND		
52 Woodward Ave., Detroit, Mich.		July 7, 1875
HEQUEMBOURG, CHARLES EZRA		
305 Central Ave., Dunkirk, N. Y.		June 5, 1901
HERBERT, ARTHUR POWIS		
Engr. and Supt., Colima Div., Mex. Nat'l Constr. Co., Colima, Col., Mexico		Sept. 5, 1888
HERBERT, HARRY MONMOUTH		
Cons. and Contr. Engr., Bound Brook, N. J.		April 6, 1898
HERING, RUDOLPH		
(Rudolph Hering & George W. Fuller, Hydr. Engrs. and San. Experts) 100 William St., New York City.		Jan. 5, 1876
HERMANN, EDWARD ADOLPH		
Sewer Commr., Room 311, City Hall, St. Louis, Mo.		April 6, 1887
HERMANY, CHARLES		
Chf. Engr. and Supt., Louisville Water Co., Louisville, Ky.		Jan. 6, 1869
HERRICK, HENRY AUGUSTUS		
Hydr. and Mill Engr., 242 Prospect St., Manchester, N. H.		May 7, 1890
HERRON, JOHN		
Mgr., The Tomboy Gold Mines Co., Ltd., Telluride, Colo.		Oct. 4, 1893
R. HERSCHEL, CLEMENS		
Hydr. Engr., 2 Wall St., New York City		April 21, 1869

HEUER, WILLIAM HENRY			
Lt.-Col., Corps of Engrs., U. S. A., 41 Flood Bldg., San Francisco, Cal.....		Mar. 3, 1880	
HEWITT, CHARLES EDWARD			
Care, The Trenton Iron Co., Trenton, N. J.....		Oct. 5, 1887	
HICKOK, HENRY ADDISON			
Mech. Engr., 762 Broad St., Newark, N. J.....		Oct. 7, 1896	
HIDER, ARTHUR			
U. S. Asst. Engr.; Res. Engr. in Local Chg. of Impvts., Lake Providence Reach, Mississippi River, Greenville, Miss		Sept. 7, 1881	
HILDENBRAND, WILHELM			
1 Broadway, New York City.....		Feb. 5, 1902	
HILGARD, KARL EMIL			
Cons. Civ. Engr.; Prof. of Civ. Eng., Federal Swiss Polytechnic Inst., 18 Steinwiesstrasse, Zurich, V., Switzerland.....		June 4, 1890	
HILL, ALBERT BANKS	{ Jun.	Feb. 2, 1876	
Cons. Civ. Engr., P. O. Box 973, New Haven, Conn.....	{ M.	Mar. 5, 1884	
HILL, GEORGE	{ Assoc. M.	Oct. 4, 1893	
Archt. and Engr., 150 Fifth Ave., New York City . . . { M.		Feb. 1, 1899	
HILL, JOHN WILLMUTH	{ Jun.	Feb. 3, 1875	
Cons. Engr., Water-Works, Sewerage, etc., 35 Glenn Bldg., Cincinnati, Ohio (also 710 City Hall, Philadelphia, Pa.).	{ M.	April 5, 1876	
HILL, WALTER HOVEY			
Civ. and Min. Engr.: U. S. Deputy Mineral Surv., Grangeville, Idaho.....		June 5, 1901	
R. HILL, WILLIAM RYAN			
Chf. Engr., Aqueduct Comm., 280 Broadway, New York City...		July 1, 1892	
HILLMAN, CHARLES LA FLETCHER			
Box 185, Santiago, Chili.....		July 5, 1876	
HILLS, FRANCIS LOWELL			
Vice-Pres. and Treas., Barker Cotton Mill Co., Mobile, Ala.....		Mar. 4, 1891	
HILTON, GEORGE PORTER			
Vice-Pres., Hilton Bridge Constr. Co., Albany, N. Y.....		May 1, 1889	
HIMES, ALBERT JAMES			
Bridge Engr., N. Y., C. & St. L. R. R., 521 Hiecox Bldg., Cleveland, Ohio	{ Assoc. M. M.	Nov. 6, 1895 June 7, 1899	
HIMMELWRIGHT, ABRAHAM LINCOLN ARTMAN			
Mgr., The Roebling Constr. Co., 121 Liberty St., New York City.....		Oct. 5, 1898	
HINCKLEY, HOWARD VERNON			
U. S. Superv. Engr., Muskogee, Ind. T.....		Dec. 5, 1883	
HINCKLEY, JOHN FRANKLIN			
Chf. Engr. of Constr., St. Louis & San Francisco R. R., Sherman, Tex		May 6, 1885	
HINDS, FRANKLIN ALLEN			
28 Flower Bldg., Watertown, N. Y.....		May 3, 1899	
HITCHCOCK, FREDERICK COLLAMORE	{ Assoc. M.	Mar. 7, 1894	
Care, Geo. S. Good & Co., El Paso, Tex. { M.		Feb. 6, 1895	

Date of
Membership.

HOAG, SIDNEY WILLETT, Jr.		
Asst. Engr., Dept. of Docks and Ferries, New York City	Sept. 2, 1885	
HOBBY, ARTHUR STANLEY		
Civ., Hydr. and San. Engr., 429 Byrne Bldg., Los Angeles, Cal.	June 6, 1894	
HOBSON, JOSEPH		
Chf. Engr.'s Office, Grand Trunk Ry., Montreal, Que., Canada.	Feb. 5, 1890	
HODGDON, FRANK WELLINGTON		
Engr., Mass. Board Harbor and Land Commrs., Room 131, State House, Boston, Mass.....	Dec. 3, 1884	
HODGE, HARRY SEYMOUR		
Pres., Sam'l F. Hodge & Co. (Inc.), 320 Atwater St., Detroit, Mich.....	Oct. 3, 1894	
HODGE, HENRY WILSON	{ Jun.	Jan. 5, 1887
Cons. Engr., 1 Nassau St., New York City.....	{ M.	Oct. 2, 1895
HODGES, GILBERT		
Cons. Engr., 60 State St., Rooms 312-14, Boston, Mass.....	June 4, 1890	
HOECH, THEODOR GOTTLIEB		
Baurath, Kolberg, Germany.....	June 7, 1893	
HOFF, OLAF		
(Hoff Bros., Engrs. and Contrs.) 228 Lumber Exchange, Minneapolis, Minn.....	May 6, 1885	
HOFFMAN, NATHANIEL BAKER KLINE		
Asst. Engr., Dept. of Sewers, Borough of the Bronx, 60 West 129th St., New York City.....	Nov. 6, 1901	
HOLBROOK, FREDERICK WILLIAM DOANE		
The Navy Yard, Puget Sound, Bremerton, Wash	Oct. 6, 1886	
HOLBROOK, HENRY RANDOLPH		
Pres., Laguna Canal Co., Pueblo, Colo.....	Jan. 2, 1890	
HOLGATE, HENRY		
Cons. and Superv. Engr., 510 McKinnon Bldg., Toronto, Ont., Canada.....	Oct. 2, 1901	
HOLMAN, MINARD LAFEVER		
Cons. Engr., 3744 Finney Ave., St. Louis, Mo.....	April 2, 1884	
HOLT, HERBERT SAMUEL		
Pres., Montreal Gas Co., Montreal, Que., Canada.....	Mar. 6, 1889	
HOOD, RICHARD HADEN	{ Assoc. M.	May 3, 1893
Care, R. H. Hood Co., 220 Broadway, New York City.	{ M.	Nov. 2, 1898
HOOD, WILLIAM		
Chf. Engr., Southern Pacific Co., 4 Montgomery St., San Fran- cisco, Cal	Oct. 7, 1896	
HOOK, CHARLES ADDISON		
17 E. Fayette St., Baltimore, Md.....	Jan. 3, 1900	
HOOK, GULIAN SCHMALZ		
Res. Engr., General Electric Co., Schenectady, N. Y.....	Apr. 3, 1901	
HOOVER, JOSEPH WARREN		
Contr. Mgr., American Bridge Co. of N. Y., 514 New York Life Bldg., Kansas City, Mo.....	June 6, 1888	
HOPKINS, CHARLES COMSTOCK		
(Knight & Hopkins, Civ. Engrs.) Rome, N. Y.....	June 4, 1890	

HORTON, HORACE E.			
Prop., Chicago Bridge & Iron Co., Throop and 105th Sts., Chicago, Ill.	Sept. 6, 1882		
HOTCHKISS, CHARLES WILCOX			
Cons. Engr., 1763 Monadnock Blk., Chicago, Ill.	Jan. 5, 1898		
HOUGH, DAVID LEAVITT			
Pres., The United Engineering & Contracting Co., 13 Park Row, New York City	May 5, 1897		
HOUSE, FRANCIS EDWIN			
Pres., D. & I. R. R. Co., Duluth, Minn.	May 1, 1895		
HOVEY, OTIS ELLIS			
Engr., Designing Dept., American Bridge Co., Pen-coy'd, Pa.	Assoc. M. April 4, 1894 M. Jan. 3, 1900		
HOWARD, FREDERICK BILLINGS			
Cons. Engr., 171 Griswold St. Detroit, Mich.	Jun. Mar. 3, 1875 M. Nov. 6, 1878		
HOWE, EDWARD WILLARD			
Asst. Engr., Eng. Dept., 65 City Hall, Boston, Mass.	Sept. 7, 1887		
HOWE, HORACE JOSEPH			
Asst. Engr., Rapid Transit R. R. Comm., 231 West 125th St., New York City.	Jun. May 2, 1888 M. Mar. 2, 1898		
HOWE, MALVERD ABIJAH			
Prof. of Civ. Eng., Rose Polytechnic Inst., 2108 North 10th St., Terre Haute, Ind.	Assoc. M. May 7, 1890 M. Jan. 1, 1896		
HOWE, MILTON GROSVENOR			
918 Austin St., Houston, Tex.	Oct. 16, 1872		
HOWE, WILLIAM BELL WHITE			
Cons. Engr., Spartanburg, S. C.	Mar. 1, 1893		
HOWELL, DAVID JANNEY			
(Howell & Taylor) 605 Twelfth St., N. W., Washington, D. C.	Sept. 5, 1900		
HOWELL, FRANKLIN DAVINPORT, Jr.			
Civ. and Contr. Engr., 26 South 15th St., Philadelphia, Pa.	June 5, 1901		
HOXIE, RICHARD LEVERIDGE			
Maj., Corps of Engrs., U. S. A., U. S. Engr. Office, St. Paul, Minn.	June 2, 1886		
HOYT, WILLIAM EDWIN			
Asst. Engr., N. Y. C. & H. R. R. Co. (Res., 50 Westminster Rd.), Rochester, N. Y.	Mar. 5, 1884		
HUDSON, CLARENCE WALTER			
Asst. Engr., Phoenix Bridge Co., Phoenixville, Pa.	Assoc. M. Nov. 7, 1894 M. Feb. 7, 1900		
HUDSON, JOHN ROGERS			
2110 Locust St., St. Louis, Mo.	May 4, 1887		
HUGHES, WILLIAM MACKENZIE			
Cons. Bridge Engr., 1511 Great Northern Bldg., Chicago, Ill.	June 2, 1880		
HULL, FRANK EUGENE			
Gardiner, Me.	Mar. 6, 1901		
HUMPHREYS, ALEXANDER CROMBIE			
(Humphreys & Glasgow) 31 Nassau St., New York City; Pres., Buffalo Gas Co.	Mar. 6, 1895		

Date of
Membership.

HUMPHREYS, DAVID CARLISLE			
Prof. of Civ. Eng., Washington and Lee Univ., Lexington, Va.	Nov. 2, 1887		
HUNT, CHARLES WARREN (<i>Secretary.</i>)			
220 West 57th St. (Res., 171 West 88th St.), New York City.....	Jan. 2, 1884		
HUNT, CONWAY BETHUNE			
Computing Engr., District of Columbia, District Bldg. (Res., 1815 M St., N. W.), Washington, D. C.....	Feb. 4, 1891		
HUNT, ROBERT WOOLSTON			
Cons. Engr., 1121 The Rookery, Chicago, Ill.	June 3, 1885		
HUNTER, WILLIAM			
Chf. Engr., Philadelphia & Reading Ry., Room 520, Reading Terminal, Philadelphia, Pa.....	June 5, 1895		
HURRY, EDWARD HENRY			
Engr., Atlas Portland Cement Co., Bethlehem, Pa.....	June 1, 1898		
HUTCHINGS, WILLIAM EVELYN			
Asst. Engr., L. & N. R. R. Co., 1578 Barrett Ave., Louisville, Ky.	June 7, 1899		
HUTCHINS, JERE CHAMBERLAIN	{ Assoc. M.	Mar. 2, 1898	
Pres., Detroit Elec. Ry., Detroit, Mich.....	{ M.	April 4, 1900	
HUTCHINSON, GEORGE HUNT	{ Assoc. M.	Sept. 2, 1891	
Chf. Engr., Northwestern Fuel Co., St. Paul, Minn. { M.	June 7, 1893		
HUTTON, NATHANIEL HENRY			
Harbor Engr. (Pres., Harbor Board), City Hall, Baltimore, Md.	June 3, 1896		
HYDE, ABRAHAM LINCOLN	{ Assoc. M.	April 5, 1893	
287 Washington Ave., New Haven, Conn.....	{ M.	Oct. 6, 1897	
INGERSOLL, COLIN MACRAE, Jr.			
Chf. Engr., N. Y., N. H. & H. R. R., New Haven, Conn.....	June 5, 1895		
IRWIN, JAMES CLARK	Jun.	April 4, 1893	
Div. Engr., Middle Div., New York Central & Hud- son River R. R., Albany, N. Y.....	{ Assoc. M. { M.	Dec. 7, 1898 June 6, 1900	
ISAACS, JOHN DOVE			
Asst. Engr., M. of W., Pacific System and Lines in Oregon, S. P. Co., 4 Montgomery St., San Francisco, Cal.....	Mar. 7, 1894		
IVES, EDWARD BERNARD			
Capt. and Signal Officer, Care, Chf. Signal Officer, Div. of the Philippines, Manila, Philippine Islands.....	April 5, 1893		
JACKMAN, HOWARD HILL			
Asst. Engr., Chg. Location, Chesapeake Western Co., Harri- sonburg, Va.....	May 6, 1891		
JACKSON, DUGALD CALEB			
Cons. Engr. and Expert; Prof. of Elec. Eng., Univ. of Wis- consin, Madison, Wis.....	Nov. 2, 1898		
JACKSON, JONES MUMFORD			
Schenectady, N. Y.....	Sept. 1, 1886		
JACKSON, THOMAS MOORE			
Pres., West Va. Short Line R. R., Clarksburg, W. Va.....	June 3, 1891		
JACKSON, WILLIAM (<i>Director.</i>)			
City Engr., City Hall, Boston, Mass.....	Sept. 3, 1884		

JAMESON, CHARLES DAVIS			
Gen. Mgr., Jameson & Co., Tientsin, China.....		Mar.	7, 1888
JAMIESON, JOHN QUINTIN			
475 Hassalo St., Portland, Ore.....		Nov.	6, 1889
JANNEY, WILLIAM DEAN			
Chf. Engr., Northern Ry., Limon, Costa Rica.....		April	1, 1896
JAQUES, WILLIAM HENRY			
Little Boar's Head, N. H.....		July	2, 1890
JARDINE, ALEXANDER WILLIAM			
Brisbane, Queensland, Australia.....		April	2, 1890
JARVIS, CHARLES MAPLES			
Vice-Pres., P. & F. Corbin, New Britain, Conn.....		Jan.	7, 1885
JAYCOX, THOMAS WILLIAM			
Civ. and Hydr. Engr., Leadville, Colo.....		Jan.	4, 1882
JENKINS, WILLIAM DUNBAR			
Care, "The Holland," Scranton, Pa.....		Sept.	7, 1887
JENNINGS, WILLIAM TYNDALE			
Cons. Engr., The Molsons Bank Bldg., Toronto, Ont., Canada..		April	2, 1884
JEWETT, WILLIAM CORNELL			
Res. Engr., Commrs. of Water-Works, 541 Ridgeway Ave., Avondale, Cincinnati, Ohio		June	3, 1885
JOHNSON, ALBERT LINCOLN			
Compy. Engr. for St. Louis Expanded Metal Fire- proofing Co., 606 Century Bldg., St. Louis, Mo... {	Assoc. M. M.	Sept.	2, 1896 Dec. 4, 1901
JOHNSON, FRANCIS ROBERT			
P. O. Box 54, Maritzburg, Natal, South Africa.....		June	1, 1898
JOHNSON, JAMES MORELAND			
Pres. and Engr., Louisville Bridge & Iron Co., Louisville, Ky..		July	1, 1891
JOHNSON, JOHN BUTLER			
Dean of the College of Engineering, Univ. of Wisconsin, Madison, Wis.....		April	7, 1886
JOHNSON, LEWIS ELISHA			
Engr. of Constr., Bridge Dept., Pennsylvania Steel Co., Steelton, Pa..... {	Assoc. M. M.	Nov.	4, 1896 May 1, 1901
JOHNSON, LORENZO MEDICI		{	Jun. 3, 1875
Apartado 21, Ciudad Porfirio Diaz, Coahuila, Mexico.... {	M.	April	7, 1880
JOHNSON, LUCIEN SAMUEL			
Junior Engr., U. S. Insp., U. S. Engr. Dept., Jamestown, R. I.		Dec.	4, 1901
JOHNSON, PHELPS			
Mgr., Dominion Bridge Co., Ltd., Windsor Hotel, Montreal, Que., Canada.....		July	1, 1891
JOHNSON, THOMAS H. (<i>Director.</i>)			
Cons. Engr., Pennsylvania Lines West of Pittsburg, Pittsburg, Pa.....		Sept.	5, 1877
JOHNSON, WALLACE CLYDE			
Chf. Engr., Shawenegan Water Power Co.; Cons. Engr., Niagara Falls Hydr. Power & Mfg. Co., Hannawa Falls Water Power Co., and Pittsburg Reduction Co., Niagara Falls, N. Y.....		Oct.	5, 1892

Date of
Membership.

JOHNSTON, ALBERT WILLIAM			
Gen. Supt., N. Y., C. & St. L. R. R., 424 Hickox Bldg., Cleveland, Ohio	Mar.	6, 1895	
JOHNSTON, HORACE GREELEY	Sept.	7, 1887	
Gen. Mgr., American Well and Prospecting Co., Corsicana, Tex.			
JOHNSTON, JOHN HOWARD	Mar.	1, 1876	
Care, Backus & Johnston, Lima, Peru.....			
JONES, WASHINGTON	Oct.	7, 1874	
Con. Mech. Engr., 1632 North 15th St., Philadelphia, Pa.....			
JORDAN, EDWARD CLARENCE	May	7, 1890	
31½ Exchange St., Portland, Me.....			
JUDSON, CHARLES ALBERT	Jan.	3, 1894	
Seey. and Treas., Erie County Investment Co., Sandusky, Ohio.			
JUDSON, WILLIAM PIERSON	Sept.	7, 1881	
Deputy State Engr. of New York, Albany, N. Y.....			
JUDSON, WILLIAM VOORHEES			
Capt., Corps of Engrs., U. S. A., Washington Barracks, Wash- ington, D. C.....	Nov.	4, 1896	
JUENGST, HENRY FREDERICK	April	2, 1884	
Care, City Water Co., East St. Louis, Ill.....			
JUST, GEORGE ALEXANDER	Jun.	Sept. 3, 1884	
Cons. Engr., 128 West 42d St., New York City.....	{ M.	Mar. 4, 1891	
KADONO, CHOKURO			
Engr. and Mgr., Okuro & Co., 53 New Broad St., London, E. C., England.....	Jan.	8, 1902	
KAREISCHA, SERGE DE			
Prof. of the Imperial Inst. of Engrs. of Ways and Communica- tion, Kouznetchny, Pereoulok, No. 18, Log. 6., St. Petersburg, Russia.....	June	6, 1894	
KASTL, ALEXANDER EDWARD	Jun.	Jan. 4, 1888	
Div. Engr., Met. Water-Works, 98 Walnut St., Clinton,	{ M.	Nov. 5, 1890	
Mass.			
KATTE, WALTER			
Cons. Engr., Irvington-on-Hudson, N. Y.....	Oct.	7, 1869	
KAUFMAN, GUSTAVE			
Cons. and Contr. Engr., 1 Broadway, New York City.....	May	7, 1890	
KEATING, EDWARD HENRY			
Mgr., Toronto Ry. Co., Toronto, Ont., Canada.....	June	7, 1882	
KEEPER, GEORGE ALEXANDER			
Res. Engr., Dom. Public Works, New Westminster, B. C., Canada.....	Jan.	2, 1889	
KEEFER, THOMAS COLTRIN (<i>Past-President</i>)			
Ottawa, Ont., Canada.....	April	4, 1877	
KEENE, WILLIAM FAITOUTE	{ Assoc. M.	June 3, 1896	
City Engr., Central Falls, R. I.....	{ M.	May 1, 1901	
KEITH, GEORGE THOMAS			
(Woltmann, Keith & Co.) 11 Wall St., New York City; Address, Olean, N. Y.....	May	4, 1881	

KEITH, HERBERT CARY			
Bridge Engr., M. C. & F. D. R. R., Fort Dodge, Iowa.....		Dec.	4, 1889
KELLER, CHARLES			
Capt., Corps of Engrs., U. S. A., U. S. Engr. Office, 57 Park St., Grand Rapids, Mich.....		Mar.	7, 1900
KELLEY, HOWARD GEORGE			
Chf. Engr., Minneapolis & St. Louis R. R. and Iowa Central Ry. Co., 1124 Guaranty Bldg., Minneapolis, Minn.....		May	1, 1889
KELLEY, WILLIAM DATUS			
(Kelly & Kelley, Engrs., Bldrs. and Contrs.) 45 East 42d St., New York City.....		Nov.	2, 1887
KELLOGG, CHARLES			
Athens, Pa....		June	2, 1880
KELLOGG, NORMAN BENJAMIN	{ Jun.	Feb.	6, 1878
420 California St., San Francisco, Cal.....	M.	July	3, 1895
KELLY, CASSIUS WILLIAM	{ Jun.	Mar.	1, 1882
City Engr., 17 City Hall, New Haven, Conn.....	M.	June	6, 1888
KENDRICK, JOHN WILLIAM			
Third Vice-Pres., Atchison, Topeka & Santa Fe Ry. System, 77 Jackson St., Chicago, Ill.....		June	6, 1883
KENLY, WILLIAM LACY			
Lake Montebello, Baltimore, Md.....		Nov.	7, 1894
KENLY, WILLIAM WATKINS			
Treas. and Gen. Mgr., The U. S. Mortar Supply Co., 1123 Broadway, New York City		Nov.	6, 1889
KENNEDY, JAMES HENRY			
Chf. Engr., Vancouver, Victoria & Eastern Ry. & Navigation Co., Grand Forks, B. C., Canada		May	2, 1900
KENNEDY, JOHN			
Chf. Engr., Harbor Commrs., Montreal, Que., Canada.....		Sept.	1, 1875
KENNEDY, WILLIAM HARLIN (<i>Director.</i>)			
Chf. Engr., The Oregon R. R. & Navigation Co., Portland, Ore.		Sept.	6, 1871
KERNOT, WILLIAM CHARLES			
Prof. of Eng., Univ. of Melbourne, Melbourne, Victoria, Aus- tralia.....		Mar.	6, 1889
KERR, FRANK MONTGOMERY			
831 Bourbon St., New Orleans, La.....		Oct.	2, 1901
KHUEN, RICHARD, JR	{ Jun.	Dec.	3, 1891
Div. Engr., Pittsburg Div., American Bridge Co.,	Assoc. M.	May	1, 1895
51st and Butler Sts., Pittsburg, Pa.....	M.	Nov.	2, 1898
KIELLAND, SOREN THEODOR MUNCH BULL			
Civ. Engr., Buffalo Creek R. R.; Office, 364 Ellicott Sq., Buffalo, N. Y		Feb.	6, 1889
KIERSTED, WYNKOOP			
Cons. Engr., 58 Water-Works Bldg., Kansas City, Mo.....		Oct.	5, 1887
KIMBALL, GEORGE ALBERT			
Chf. Engr., Elev. Lines, Boston Elev. Ry. Co., 101 Milk St., Boston, Mass.....	{ Jun. M.	May	12, 1875
		July	1, 1891

Date of
Membership.

KIMBALL, GEORGE HENRY			
Chf. Engr., Pere Marquette R. R. Co., Fort St. Union Station, Detroit, Mich.....	Dec.	3, 1890	
KINDER, CLAUDE WILLIAM			
Engr. in Chf. and Supt., Imperial Chinese Rys., Tientsin, China.	June	4, 1890	
KING, CHARLES CYRUS			
Chf. Engr., C. W. Hunt Co., West New Brighton, Richmond Co., N. Y.....	Sept.	2, 1891	
KING, PAUL SOURIN			
Cons. Engr., 25 West 23d St., New York City	July	3, 1889	
KING, WILLIAM BYRD			
Vice-Pres. and Supt., Fort Worth & Rio Grande Ry. (Frisco System), Fort Worth, Tex.....	Oct.	7, 1896	
KING, WINFIELD SCOTT			
Chf. Engr., Union Stock Yards & R. R. Co., South Omaha, Nebr.	Dec.	6, 1899	
KINGMAN, LEWIS			
Chf. Engr., Mexican Central Ry., Mexico, D. F., Mexico.....	July	1, 1885	
KINGSLEY, MARVIN WATSON			
Rose Bldg., Cleveland, Ohio.....	July	3, 1878	
KINNEY, EDWARD CORNELIUS			
Gen. Mgr., West Gallatin Irrig. Co., Bozeman, Mont.....	May	3, 1882	
KINSLEY, THOMAS PEARSON			
Broadway and 157th St., New York City	Feb.	5, 1873	
KIRKPATRICK, WALTER GILL			
City Engr.; also Kirkpatrick & Johnson, Civ. and Mech. Engrs., Jackson, Miss.....	Assoc. M. M.	April 6, 1892 Oct. 5, 1898	
KIRTLAND, ALFRED POTTER			
1206 Carnegie Bldg., Pittsburg, Pa.....	Sept.	7, 1887	
KITTREDGE, GEORGE WATSON			
Chf. Engr., The C., C., C. & St. L. Ry. Co., Cincinnati, Ohio..	Jan.	6, 1886	
KITTRELL, JAMES WESSON			
Smiths Landing, Greene Co., N. Y.....	Sept.	1, 1897	
KLAPP, EUGENE			
Div. Engr., Rapid Transit R. R. Commrs., 231 West 125th St., New York City.....	Feb.	6, 1901	
KLEINEBECK, AUGUST GUSTAVE			
Engr., Bridges and Bldgs., Oklahoma City & Western R. R., Box 1062, Oklahoma City, Okla. T.....	Feb.	3, 1897	
KNAP, JOSEPH MOSS (<i>Treasurer.</i>)			
103 West 58th St., New York City.....	April	5, 1882	
KNAPE, LOUIS HENRY			
Chf. Engr., Buffalo Water-Works, 280 Linwood Ave., Buffalo, N.Y.	Mar.	4, 1874	
KNICKERBACKER, JOHN			
Pres., Eddy Valve Co. of Waterford, N. Y. (Res., 86 First St., Troy, N. Y).....	Jan.	2, 1900	
KNIGHT, WALTER HARRIS			
20 Broad St., New York City.....	Feb.	1, 1893	
KNOWLTON, CHARLES ANDREWS			
Administrador, Central Ysabel, Guantanamo, Cuba	Oct.	2, 1901	

Date of
Membership.

KONDO, SENTARO			
Doboku Kantokusho, Tokyo, Japan.....		Nov. 7, 1900	
KONDO, TORAGORO		Jun.	Oct. 3, 1888
Chf. Engr., Home Dept., Tokyo, Japan.....	' M.	June 5, 1901	
KUERSTEINER, EMIL EDWARD			
Asst. Engr., L. & N. R. R., 1954 Floyd St., Louisville, Ky.....		Dec. 1, 1897	
KUICHLING, EMIL (<i>Director.</i>)			
Cons. Engr., 209 Clinton Ave. North, Rochester, N. Y.....		Sept. 3, 1884	
KUNZ, FREDERIC CHARLES			
Asst. to Vice-Pres., Eng. Dept., American Bridge Co., Pencoyd, Pa.....	{ Assoc. M. M.	Feb. 6, 1895 Dec. 7, 1898	
LABELLE, HENRY FRANCIS			
Engr., New Water Supply, Santiago de Cuba, Cuba.....		April 6, 1898	
LA CHICOTTE, HENRY ARTHUR			
Asst. Engr., East River Bridge No. 3, 1199 Dean St., Brooklyn, N. Y.....		Oct. 3, 1894	
LAMB, RICHARD			
Chf. Engr., Virginia Copper Co., Ltd., High Hill, Va.....	{ Assoc. M. M.	May 6, 1891 June 6, 1900	
LANDON, EUGENE ASHBEL			
Mgr. and Engr., Groton Branch of American Bridge Co., Groton, Tompkins Co., N. Y.....		April 1, 1896	
LANDOR, EDWARD JOHN			
Engr. in Chg. of Constr., Concrete and Steel Y Bridge at Zanesville, Ohio (Res., 209 High St., Canton, Ohio).....		Mar. 7, 1888	
LANDRETH, OLIN HENRY			
Prof. of Eng., Union College; Cons. Engr., Schenectady, N. Y.		Sept. 3, 1884	
LANDRETH, WILLIAM BARKER			
Res. Engr., Eastern Div., New York State Canals, State Hall, Albany, N. Y.....		Oct. 3, 1888	
LANGE, GUNARDO AUFIN			
Care, Fr. J. Morison, Casilla de Correa No. 1098, Buenos Aires, Argentine Republic.....		Mar. 3, 1897	
LANGTON, JOHN			
Mech. and Elec. Engr., 72 Trinity Pl., New York City.....		May 2, 1900	
LATCHA, JACOB ALBERT			
Coldwater, Mich.....		May 7, 1873	
LATROBE, CHARLES HAZLEHURST			
Civ. and Cons. Engr., Merchants Nat'l Bank Bldg., Baltimore, Md.....		Nov. 16, 1870	
LAUB, HERMANN			
348 Sixth Ave., Pittsburg, Pa.....		Sept. 1, 1897	
LAWLOR, FRANCIS DENIS HUBERT			
Engr. in Chg., Port Colborne Entrance Impvt., Port Col- borne, Ont., Canada	{ Jun. M.	Oct. 6, 1886 Mar. 6, 1895	
LAWTON, WILLIAM HENRY			
Civ. and San. Engr., Newport, R. I.....		June 2, 1886	

		Date of Membership
LEA, SAMUEL HILL	128 West 36th St., New York City.....	Nov. 3, 1897
LEAVITT, ERASMIUS DARWIN	Mech. Engr., 2 Central Sq., Cambridge, Mass.....	July 2, 1873
LEAVITT, FRANK McDOWELL	Mech. Engr., 258 Broadway, New York City.....	Dec. 2, 1885
LE BARON, JOHN FRANCIS	Chf. Engr., American Honduras Co., and Patuca Plantation Co., 206 Arcade, Cleveland, Ohio.....	June 7, 1882
LE CONTE, LOUIS JULIAN	U. S. Asst. Engr. in Chg. Oakland Harbor Works (P. O. Box 482), Oakland, Cal.....	April 4, 1877
LEDERLE, GEORGE ANTHONY	New York Life Bldg., Chicago, Ill.....	May 2, 1883
LEDLIE, CHARLES HEES	Cons. Engr., 918 Rialto Bldg., St. Louis, Mo.....	Oct. 6, 1886
LEDOUX, JOHN WALTER	Chf. Engr., The American Pipe Mfg. Co. and The National Gas & Constr. Co., 112 North Broad St., Philadelphia, Pa.....	Jan. 4, 1888
LEE, EDWARD HERVEY	Engr. and Gen. Roadmaster, Chicago & Western Indiana R. R. and the Belt Ry. of Chicago, Chicago, Ill.....	June 5, 1895
LEE, WELLINGTON BARNES	Engr. and Machinist, 75 Guernsey St., Brooklyn, N.Y. { Assoc. M. M.	Feb. 5, 1896
LEFFINGWELL, WILLIAM HOWLAND	Chf. Engr., El Paso & Southwestern R. R., El Paso, Tex.....	May 4, 1898
LEHLBACH, GUSTAV	770 Broad St., Newark, N.J.....	Oct. 4, 1893
LEHNARTZ, FREDERICK WILLIAM	U. S. Asst. Engr., Grand Rapids, Mich.....	Mar. 7, 1883
LEISEN, THEODORE ALFRED	Cons. Engr.; Chf. Engr. of Parks, Wilmington, Del.....	Aug. 6, 1879
LELAND, GEORGE HERBERT	929 Banigan Bldg., Providence, R. I.....	June 2, 1897
LELAND, WARREN ALLSTON	Columbia, S. C.....	May 2, 1887
LEONARD, HENRY READ	77 Baltimore Ave., Lansdowne, Pa.....	Feb. 1, 1893
LEVERICH, GABRIEL	373 Stuyvesant Ave., Brooklyn, N. Y.....	Oct. 3, 1900
LEWINSON, MAXYMILIAN	128 West 42d St., New York City.....	April 4, 1894
LEWIS, EUGENE CASTNER	Pres., Seymour Powder Co. and Louisville & Nashville Terminal Co., Nashville, Tenn	July 6, 1870
LEWIS, EVERETT WILSON	Willmar, Minn.....	Feb. 7, 1894
LEWIS, FREDERICK HUMPHREYVILLE	Mgr., Virginia Portland Cement Co., Craigsville, Va.	Sept. 4, 1901
		Jan. 6, 1897

MEMBERS.

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Date of
Membership.

LEWIS, NELSON PETER			
Chf. Engr. and Supt., Bureau of Highways, Brooklyn, N. Y....	Oct.	2, 1895	
LEWIS, SIDNEY FRANCIS			
State Engr., 4th Floor, Room 2, Cotton Exchange Bldg., New Orleans, La.....	May	4, 1881	
LIBBY, EDMUND DORMAN			
U. S. Asst. Engr., Custom House, St. Louis, Mo.....	May	6, 1885	
LIEB, JOHN WILLIAM, JR.			
Assoc. Gen. Mgr., The New York Edison Co., 55 Duane St., New York City.....	Oct.	5, 1898	
LINCOLN, WILLIAM SHATTUCK			
Chf. Engr., Wabash R. R., 7th and Chestnut Sts., St. Louis, Mo.	Dec.	5, 1883	
R. LINDENTHAL, GUSTAV			
Commr. of Bridges of the City of New York, Park Row Bldg., New York City.....	May	3, 1882	
LINTON, HARVEY			
City Engr., Altoona, Pa.....	Oct.	5, 1892	
LINVILLE, JACOB HAYS			
Cons. Engr., 117 South 38th St., Philadelphia, Pa.	Mar.	3, 1875	
LIPPINCOTT, JOSEPH BARLOW			
Hydr. Engr.; Res. Hydrographer for California for the U. S. Geological Survey, 406 Byrne Bldg., Los Angeles, Cal.....	Dec.	6, 1899	
LLEWELLYN, FRANCIS JOHN			
Pres., Koken Iron Works, Manchester and Choteau Aves., St. Louis, Mo.....	Nov.	4, 1896	
LOCKE, CHARLES ABBOTT			
Nashville, Tenn.....	Oct.	3, 1888	
LOCKE, FRANKLIN BUCHANAN			
North Adams, Mass.....	Mar.	1, 1893	
LOCKWOOD, JAMES BUTTON CLYDE			
Cons. Engr., 70 Dexter Horton Bldg., Seattle, Wash.....	Mar.	6, 1901	
LOCKWOOD, JUDD ALLEN			
Asst. Engr., Dept. of Bridges, 600 Lenox Ave., New York City..	April	4, 1899	
LOFLAND, HENRY FIDDEMAN			
Mgr., Eastern Div., Erecting Dept., American Bridge Co. of New York, Pencoyd, Pa.....	June	2, 1897	
LONG, THOMAS JOHN			
Vice-Pres., Atlantic, Gulf & Pacific Co., Civ. Engrs. and Contrs., Park Row Bldg., New York City.....	Jun.	2, 1875	
	M.	Jan.	7, 1880
LOOMIS, HORACE			
Chf. Engr., Dept. of Sewers, Borough of Manhattan, 13 Park Row, New York City.....	Nov.	5, 1879	
LOREE, LEONOR FRESNEL			
B. & O. Central Bldg., Baltimore, Md.....	Oct.	6, 1886	
LOW, EMILE			
U. S. Asst. Engr., U. S. Engr. Office, 540 Federal Bldg., Buffalo, N. Y.....	May	2, 1888	

Date of
Membership.

LOWE, JESSE				
(Christie, Lowe & Heyworth, Civ. Engrs. and Contrs.)	171 La Salle St., Chicago, Ill	Jun.	Oct. 2, 1895	
LOWETH, CHARLES FREDERICK	Engr. and Supt., Bridges and Bldgs., C. M. & St. P. Ry., 1100 Old Colony Bldg., Chicago, Ill.	Jun. M.	Jan. 3, 1883 Feb. 6, 1884	
LOWRIE, HARVEY CHILDS	Denver, Colo.		Mar. 2, 1892	
LUCAS, DANIEL JONES	Dept. Pub. Works, Bureau of Water, Asst. Engr., Impt., Extension and Filtration of the Water Supply 710 City Hall, Philadelphia, Pa.	Jun. M.	Sept. 6, 1876 July 4, 1888	
LUCAS, EUGENE WILLETT VAN COURT	Capt., Corps of Engrs., U. S. A., U. S. Engr. Office, Wilmington, N. C.	Assoc M. M.	April 3, 1895 Sept. 5, 1900	
LUCIUS, ALBERT	Civ. and Mech. Engr., 137 Potter Bldg., 38 Park Row, New York City		Mar. 3, 1886	
LUDLOW, JACOB LOTT	434 Summit St., Winston, N. C.		Mar. 3, 1897	
LUM, DAVID WALKER	Asst. Gen. Supt., Maintenance, Southern Ry. Co., Washington, D. C.		May 3, 1893	
LUNDIE, JOHN	Cons. Engr., 52 Broadway, New York City		July 4, 1888	
LUSK, JAMES LORING	Maj., Corps of Engrs., U. S. A., Office, Chf. of Engrs., U. S. A., Washington, D. C.		Mar. 4, 1891	
LYDON, WILLIAM ANTHONY	Pres., Lydon & Drews Co., Engrs. and Contrs., 79 Dear- born St., Chicago, Ill.	Jun. M.	Jan. 4, 1888 Dec. 5, 1894	
LYNCH, MICHAEL LEHANE	Chf. Engr., St. L. S. W. Ry. Co., Tyler, Tex.		May 4, 1892	
LYONS, JAMES KNOX	Asst. Div. Engr., Pittsburg Div., American Bridge Co., 51st and Butler Sts., Pittsburg, Pa.; Address, Dorset Hotel, East End, Pittsburg, Pa.	Assoc. M. M.	May 1, 1895 Oct. 5, 1898	
MACALLISTER, DICKINSON	Pres. and Gen. Mgr., The Metropolitan West Side Elev. R. R. Co., Room 1001, Royal Ins. Bldg., Chicago, Ill.		April 1, 1896	
MACDONALD, CHARLES	247 Fifth Ave., New York City		Sept. 15, 1869	
MACFARLANE, JAMES	Civ. and Min. Engr.; Mgr., Horseshoe Gold Mining Co., Box 540, Salt Lake City, Utah		April 4, 1888	
MACKALL, BENJAMIN FRANKLIN	Second Asst. Chf. Engr., Seaboard Air Line R. R., Portsmouth, Va.		Mar. 6, 1901	

MEMBERS.

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Date of
Membership.

MACKENZIE, ALEXANDER			
Col., Corps of Engrs., U. S. A., Office of the Chief of Engrs., Washington, D. C.	Feb. 2, 1885		
MACKENZIE, WILLIAM BROUARD	{ Jun.	June 7, 1882	
Chf. Engr., Intercolonial Ry., Moncton, N. B., Canada. { M.	April 3, 1901		
N. MACLAY, WILLIAM WALTER			
Cons. Engr., Glens Falls, N. Y.	Nov. 6, 1872		
MACLENNAN, JOHN DONALD			
Garfield Bldg., Cleveland, Ohio.	Oct. 4, 1899		
MACNAUGHTON, JAMES			
Pres. and Treas., MacIntyre Iron Co., Tahawus, Essex Co., N. Y.	May 5, 1880		
MACRITCHIE, CHARLES	{ Assoc.	Oct. 2, 1870	
21 Quincy St., Chicago, Ill.	} M.	April 5, 1876	
McCALLA, RICHARD CALVIN	{ Jun.	July 2, 1890	
U. S. Asst. Engr., Tuscaloosa, Ala.	{ Assoc. M.	Sept. 2, 1891	
McCANN, THOMAS HENRY	} M.	Dec. 5, 1894	
Second Nat'l Bank Bldg., Hoboken, N. J. (also Care, North River Bridge Co., 45 Cedar St., New York City).	April 2, 1890		
McCARTY, RICHARD JUSTIN			
1624 Jefferson St., Kansas City, Mo.	Dec. 4, 1895		
McCLINTOCK, J. Y.			
Commr. of Public Works, Rochester, N. Y.	Oct. 2, 1895		
McCLINTOCK, WILLIAM EDWARD			
20 Pemberton Sq., Boston, Mass.	Dec. 5, 1888		
McCOLLUM, THOMAS CHALMERS			
4606 Springfield Ave., Philadelphia, Pa.	May 3, 1882		
McCOME, CHARLES OSCAR			
City Engr. and Engr. of Water Board, Watertown, N. Y.	May 2, 1900		
McCOME, DAVID E.			
Supt. of Sewers, Washington, D. C.	Feb. 7, 1877		
McCOOL, DANIEL			
Pres., Newaygo Portland Cement Co., Newaygo, Mich.	Sept. 5, 1883		
McCORMICK, GEORGE KING	{ Jun.	Feb. 6, 1889	
Road Master, L. & N. R. R., Pensacola, Fla.	} M.	May 4, 1898	
McCORMICK, ROBERT HUGH			
Cons. Engr., 6 Jones Bldg., Detroit, Mich.	Sept. 7, 1898		
McCULLOH, WALTER			
Local Mgr., The National Contracting Co., Niagara Falls, N. Y.	{ Jun. M.	July 4, 1888 June 7, 1893	
McCURDY, JOHN EGBERT			
General Post Office, City of Mexico, Mexico.	April 1, 1896		
McDONALD, HUNTER			
Chf. Engr., N., C. & St. L. Ry., Union Station, Nashville, Tenn.	{ Jun. M.	April 4, 1883 Mar. 7, 1888	
McDONALD, JOHN ALEXANDER			
Care. James E. McDonald, 4 Chapel St., Cripplegate, London, E. C., England.	Feb. 5, 1890		

	Date of Membership.	
McGRATH, WALLACE 1112 Tennessee St., Lawrence, Kans.....	Sept. 5, 1883	
McHENRY, EDWIN HARRISON Chf. Engr., Northern Pacific Ry. Co., St. Paul, Minn.....	Feb. 5, 1896	
McKAY, JOHN EDWARDS First Asst. Engr.. Dept. of Water Supply, 13 Park Row, New York City.....	July 5, 1893	
McKEEN, BENJAMIN Supt., Main Line Div., Vandalia Line, 201 South 6th St., Terre Haute, Ind.....	Nov. 6, 1895	
McKENZIE, THEODORE HALL Engr., State Board of Health ; Mem., State Board of Civ. Engrs., 40 Stearns Bldg., Hartford, Conn.....	Sept. 7, 1881	
McKEOWN, THOMAS 3135 Main St. (Office, 197 Pearl St.), Buffalo, N. Y.....	Dec. 3, 1879	
McKIM, ALEXANDER RICE Cons. Architectural Engr., 106 East 23d St., New York City....	Assoc. M. M.	April 4, 1894 May 4, 1898
McKIM, JAMES ARTHUR Chf. Engr., Haugh-Noelke Iron Works, Indianapolis, Ind.	Oct. 2, 1901	
McKINSTY, CHARLES HEDGES Capt., Corps of Engrs., U. S. A., Washington Barracks, Washington, D. C.....	Assoc. M. M.	Sept. 2, 1896 May 3, 1899
McLAIN, LOUIS RANDOLPH Pres., Florida Engineering Co., St. Augustine, Fla.....	Feb. 2, 1881	
McLAUGHLIN, JOHN JOSEPH County Engr., Queens Co., Jamaica, N. Y.....	Nov. 1, 1893	
McMATH, ROBERT EMMET Cons. Engr.; Pres., R. E. McMath Surveying Co., 328 Lincoln Trust Bldg., St. Louis, Mo.....	Mar. 3, 1880	
McMILLAN, CHARLES Prof. of Civ. Eng. and Applied Math., Princeton Univ., Princeton, N. J.....	Jan. 29, 1868	
McMINN, THOMAS JAMES (<i>Assistant Secretary.</i>) 220 West 57th St., New York City.....	Mar. 5, 1890	
McNICOL, JOHN ALEXANDER 39 Cortlandt St., New York City.....	Sept. 1, 1897	
MCNULTY, GEORGE WASHINGTON 258 Broadway, New York City.....	May 5, 1880	
MCVEAN, JOHN JAY 71 State St., Grand Rapids, Mich.....	Sept. 3, 1884	
MAIS, HENRY COATHUPE Cons. Engr., Prells' Bldgs., 60 Queen St., Melbourne, Victoria, Australia	June 6, 1883	
MAITLAND, ALEXANDER, Jr. Contr. Engr., American Bridge Co., 514 N. Y. Life Bldg., Kansas City, Mo.....	Nov. 6, 1901	

MEMBERS.

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Date of
Membership.

MALTBY, FRANK BIERCE			
Supt., Dredging Operations, Mississippi River Comm., Box 217, Memphis, Tenn.....		April 3, 1895	
MAN, ALBON PLATT			
Gen. Mgr., The Arminius Chemical Co., Mineral, Va.....		Sept. 5, 1883	
MANLEY, HENRY			
Asst. Engr., Eng. Dept., Room 52, City Hall, Boston, Mass.....		June 2, 1880	
MANNING, WILLIAM THURSTON			
Cons. Engr., 502 Equitable Bldg., Baltimore, Md.....		Feb. 5, 1896	
MANSFIELD, MARTIN WILLIAM			
Supt., Penna. Co., Indianapolis, Ind.....		July 5, 1882	
MANSON, MARSDEN			
Commr. of Public Works, City Hall, San Francisco, Cal.....		Sept. 6, 1882	
MARBURG, EDGAR			
Prof. of Civ. Eng., Univ. of Pennsylvania, Philadelphia, Pa....		Oct. 6, 1897	
MARDEN, HENRY HERMAN, Jr.			
9 Livingston Pl., New York City.....		May 1, 1901	
MARINDIN, HENRY LOUIS			
Asst., U. S. Coast and Geodetic Survey, Washington, D. C....		May 7, 1884	
MARPLE, WILLIAM MCKELVEY			
Engr., The Scranton Gas & Water Co., The Dunmore Gas & Water Co., The Olyphant Water Co., and The Archbald Water Co., Scranton, Pa.....		June 4, 1890	
MARR, GEORGE ANSON			
U. S. Asst. Engr.; Supt. and Asst. Engr., Portage Lake Ship Canals, Mich., Houghton, Mich.....		Oct. 3, 1883	
MARSHALL, HORACE MILLER			
Asst. Engr., U. S. Engr. Office, Vicksburg, Miss.....		Dec. 3, 1890	
MARSTRAND, OTTO JULIUS			
Mgr., Atlas Co., Ltd., Hopetoun House, Lloyds Ave., London, E. C., England.....		May 7, 1890	
MARTIN, CHARLES CYRIL			
Chf. Engr. and Supt., New York and Brooklyn Bridge, 179 Wash- ington St., Brooklyn, N. Y.....		July 10, 1872	
MARTIN, WISNER	{ Jun.	May 3, 1892	
Park Row Bldg., New York City.....	{ Assoc. M. M.	July 3, 1895 May 1, 1901	
MARVIN, FRANK OLIN			
Dean, School of Eng., Univ. of Kansas; Engr., Kansas State Board of Health, Lawrence, Kans.....		May 5, 1897	
MARX, CHARLES DAVID			
Prof. of Civ. Eng., Leland Stanford, Jr., Univ.; Cons. Engr., Stanford University, Santa Clara Co., Cal.....		Oct. 7, 1896	
MASON, ARTHUR JOHN			
5733 Monroe Ave., Chicago, Ill.....		Sept. 5, 1888	
MASON, SAMPSON DOUGLAS			
Supt., U. S. Fortification Work, Fort Casey, Island Co., Wash.		Oct. 6, 1886	

		Date of Membership.
MATCHAM, CHARLES ARTHUR		
Allentown, Pa.....	June 5, 1901	
MAURICE, CHARLES STEWART		
Athens, Pa.....	May 15, 1872	
MAURY, DABNEY HERNDON, Jr.		
Engr., Peoria Water-Works Co.; Cons. Engr., 129 N. Jefferson Ave., Peoria, Ill.....	May 3, 1899	
MAXIM, HIRAM STEVENS		
18 Queen's Gate Pl., London, S. W., England.....	Oct. 7, 1885	
MAXSON, FRANK OSCAR		
647 East Capitol St., Washington, D. C.	May 1, 1889	
MAXWELL, JAMES RIDDLE		
Cons. Engr., Newark, Del.....	April 17, 1872	
MAY, DECOURCY		
Gen. Mgr., New York Shipbuilding Co., Camden, N. J.....	Mar. 6, 1895	
MAY, WILLIAM ANDREW		
Gen. Mgr., Hillside Coal & Iron Co., Box 553, Scranton, Pa....	July 6, 1881	
MAYER, JOSEPH		
Cons. Engr., 1 Broadway, New York City.....	Oct. 3, 1894	
MAYNE, CHARLES		
Municipal Engr., Kiangse Rd., Shanghai, China.....	Jan. 1, 1896	
MEAD, DANIEL WEBSTER		
Asst. Engr., 605 First Nat'l Bank Bldg., Chicago, Ill. { M.	July 1, 1891	
Cons. Engr., 605 First Nat'l Bank Bldg., Chicago, Ill. } M.	Dec. 6, 1893	
MEAD, ELWOOD		
Expert in Chg. Irrig. Investigations, U. S. Dept. Agriculture, Washington, D. C.	June 7, 1893	
MEIGS, MONTGOMERY		
U. S. Civ. Engr., Office of U. S. D. M. R. Canal, Keokuk, Iowa.	Mar. 5, 1879	
MELCHER, FRANK OTIS		
Supt., Fitchburg Div., Boston & Maine R. R., Boston, Mass....	Mar. 3, 1897	
MELLISS, DAVID ERNEST		
Cons. Civ. and Min. Engr., 208 California St., San Francisco, Cal.	Oct. 2, 1895	
MELVIN, DAVID NEILSON		
Supt. and Engr., American Linoleum Mfg. Co., Linoleumville, N. Y.	July 3, 1878	
MENDELL, GEORGE HENRY		
Col., Corps of Engrs., U. S. A. (<i>Retired</i>); Pres., Board of Public Works (2360 Steiner St.), San Francisco, Cal.....	Sept. 6, 1876	
MENOCAL, ANICETO G.		
Civ. Engr., U. S. Navy, 251 West 81st St., New York City.....	Feb. 3, 1875	
MERCER, CHARLES HATTON		
Asst. Engr. of Constr., Penna. Steel Co., Steelton, Pa.	{ Assoc. M. Nov. 3, 1897	
	{ M. May 1, 1901	
MERRILL, GEORGE NATHAN		
(Geo. N. Merrill & Co., Civ. and Cons. Engrs.) 292 Main St., Room 7, Springfield, Mass.....	May 1, 1889	

MERRILL, WILLIAM FESSENDEN			
First Vice-Pres., N. Y., N. H. & H. R. R., New Haven, Conn...		April 1, 1874	
MERRIMAN, MANSFIELD			
Prof. of Civ. Eng., Lehigh Univ., South Bethlehem, Pa	Jun. M.	May 12, 1875 Sept. 3, 1884	
MERRYMAN, WILLIAM CURTIS			
Res. Engr., 3d Div., Rapid Transit Subway Constr. Co., 1913 Amsterdam Ave. (Res., 562 West 149th St.), New York City..		Oct. 4, 1899	
MEBSEREAU, CHARLES VERNON			
Asst. Engr., Water-Works Extension, 77 East May St., St. Louis, Mo.....		Dec. 3, 1884	
R. METCALF, WILLIAM (<i>Past-President.</i>)			
1 Fulton St., Pittsburg, Pa.....		July 2, 1873	
MEYER, RUDOLF			
With Compañia Fundidora de Fierro y Acero, Apartado No. 55, Monterey, Mexico		Oct. 5, 1898	
MEYER, THOMAS C.			
Care, Union Club, New York City.....		Dec. 7, 1852	
MICHELL, THEOPHILUS			
Trichinopoly, Madras Presidency, India.....		Jan. 2, 1901	
MILLER, ALEXANDER MACOMB			
Lt.-Col., Corps of Engrs., U. S. A., 2728 Pennsylvania Ave., Washington, D. C.....		June 6, 1888	
MILLER, CHARLES HENRY			
Engr. with McClintic Marshall Const. Co. of Rankin, Pa.; Address, 36 N. Oakland Sq., Pittsburg, Pa.....		May 2, 1899	
MILLER, HARVEY COOPER			
44 Pine St., New York City		June 5, 1901	
MILLER, HIRAM ALLEN			
Engr., Reservoir Dept., Met. Water-Works, 124 Walnut St., Clinton, Mass.....		May 6, 1896	
MILLER, JAMES IMBIE			
Bryn Mawr, Pa.....		Oct. 5, 1887	
MILLER, SPENCER			
Chf. Engr., Cableway Dept., Lidgerwood Mfg. Co., 96 Liberty St., New York City	Assoc. M.	July 3, 1889 Nov. 7, 1894	
MILLIS, JOHN			
Maj. of Engrs., U. S. A., U. S. Engr. Office, Seattle, Wash.....		Mar. 7, 1900	
MILLS, ARTHUR LORENZO			
Vice-Pres., The Paddock Hodge Co., 2132 Glenwood Ave., Toledo, Ohio.....		May 2, 1888	
MILLS, CHARLES MALON			
Asst. Engr. in Chg. of Bridges, Bureau of Surveys, Dept. of Public Works, Room 412, City Hall, Philadelphia, Pa.	Jun. M.	June 2, 1886 Sept. 3, 1890	
MILLS, JAMES ELLISON			
Cons. Geologist and Min. Engr., Quincy, Plumas Co., Cal.....		Feb. 3, 1886	
MITCHELL, HENRY			
P. O. Box 3643, Boston, Mass.....		Jan. 7, 1880	

		Date of Membership.
MIXER, CHARLES ADAM	Res. Engr., Rumford Falls Power Co., Rumford Falls, Me....	Nov. 1, 1893
MODJESKI, RALPH	Cons. Civ. Engr., 1742 Monadnock Bldg., Chicago, Ill.....	Jun. Dec. 1, 1886 Assoc. M. July 1, 1891 M. Mar. 3, 1897
MOHUN, EDWARD	Union Club, Victoria, B. C., Canada.....	April 6, 1892
MOLITOR, DAVID ALBERT	Civ. and Cons. Engr., 125 Park Ave., Fond du Lac, Wis.....	Oct. 6, 1897
MOLITOR, FREDERIC ALBERT	Chf. Engr., Choctaw, Oklahoma & Gulf R. R., Choctaw Northern R. R., Western Oklahoma R. R. and Hot Springs R. R.; Cons. Engr., Choctaw, Oklahoma & Texas R. R., Little Rock, Ark.....	Nov. 4, 1896
MONCRIEFF, ALEXANDER BAIN	Engr. in Chf., South Australia, Adelaide, South Australia.....	July 4, 1894
MONCRIEFF, JOHN MITCHELL	1 St. Nicholas Bldgs., Newcastle-upon-Tyne, England.....	Nov. 3, 1897
MONCURE, WILLIAM	Pres., Charlotte, Monroe & Columbia R. R., Raleigh, N. C.....	May 2, 1900
MONTFORT, RICHARD	Chf. Engr., L. & N. R. R., Louisville, Ky.....	June 6, 1888
MONTGOMERY, JOHN ALEXANDER	Receiver, Mary Lee Coal & Ry. Co., 2017 First Ave., Birmingham, Ala.....	Jan. 1, 1896
MOODY, BURDETT	Asst. to Chf. Engr., Homestake Mining Co. and Associated Corporation, Lead, S. Dak.....	Feb. 3, 1897 M. June 5, 1901
MOORE, CHARLES EDWARD	Civ. and Cons. Engr., Santa Clara, Cal.....	Jan. 7, 1880
MOORE, CHARLES HARRY	First Asst. Engr., Erie R. R. Co., N. Y., S. & W. R. R., Chicago & Erie R. R., 26 Cortland St., Room 1410, New York City.....	April 5, 1893 Assoc. M. Sept. 4, 1901
MOORE, JAMES EDWIN ALEXANDER	Engr. in Chg. of Designing and Estimating Dept., The Wellman-Seaver Engineering Co., Cleveland, Ohio.....	June 5, 1901
MOORE, ROBERT (<i>President.</i>)	Laclede Bldg., St. Louis, Mo.....	April 5, 1876
MOORE, WILLIAM HARLEY	Engr. of Bridges, N. Y., N. H. & H. R. R., New Haven, Conn..	June 4, 1895
MORAN, DANIEL EDWARD	54 Broad St., New York City.....	June 3, 1891 Assoc. M. Jan. 1, 1896
MORDECAI, AUGUSTUS	Asst. Chf. Engr., Erie R. R., Cleveland, Ohio.....	Feb. 1, 1893
MORISON, GEORGE SHATTUCK (<i>Past-President.</i>)	49 Wall St., New York City.....	Jan. 6, 1875
MORLEY, FRED	Res. Engr., St. Clair Flats Survey, Lapeer, Mich....	May 6, 1891 Assoc. M. Mar. 4, 1896

MORRILL, GEORGE SULLIVAN			
Div. Engr., N. Y., N. H. & H. R. R. Co., Boston, Mass.....	Mar.	2, 1887	
MORRIS, CHARLES JOHN AUGUSTUS			
Cons. Engr. and Contr., P. O. Box 2544, St. Paul, Minn.....	Oct.	3, 1883	
MORRIS, HENRY GURNEY			
Engr. and Machinist, 408 Phila. Bourse, Philadelphia, Pa.....	Dec.	4, 1867	
MORRIS, MARSHALL			
Cons. Engr.; Pres., Breckinridge Asphalt Co., 16 Norton Bldg., Louisville, Ky.....	Mar.	5, 1873	
MORRISON, HENRY PRENTICE			
Deputy Commr. and Chf. Engr. of Highways and Sewers; Deputy Commr. of Water Supply, Borough of Richmond, New Brighton, N. Y.....	April	6, 1898	
MORSE, BENJAMIN FRANKLIN			
729 Giddings Ave., Cleveland, Ohio	July	12, 1877	
MORSE, CHARLES ADELBERT			
Asst. Engr., A., T. & S. F. Ry., A., T. & S. F. Gen. Office Bldg., Topeka, Kans.....	April	6, 1898	
MORSE, CHARLES JAMES			
1825 Asbury Ave., Evanston, Ill.....	Feb.	6, 1884	
MORSE, CHARLES MILLER			
9 Erie County Bank Bldg., Buffalo, N. Y.....	Jan.	2, 1895	
MORSE, EDWIN KIRTLAND			
Carnegie Bldg., Pittsburg, Pa.....	June	6, 1900	
MORSE, HENRY GRANT			
Pres., New York Shipbuilding Co., Camden, N. J.....	April	7, 1880	
MORTON, CHARLES			
53 State St., Boston, Mass.....	Oct.	2, 1895	
MOSMAN, ALONZO TYLER			
Asst., U. S. Coast and Geodetic Survey, Washington, D. C.....	July	1, 1885	
MOSSCROP, ALFRED MITTON	{	Jun.	May 4, 1887
Mgr. and Engr., Rochester Plant, Empire Bridge Co., 165 Rutgers St., Rochester, N. Y.....			
MUNSTER, ANDREW WENDELBO	{	Assoc. M. M.	May 3, 1893 Oct. 4, 1899
Engr. of Bridges, C. G. W. Ry., Care, Engr.'s Office, C. G. W. Ry., St. Paul, Minn.....			
MURAKAMI, KYOICHI			
14 Wakamatsu-Cho, Osaka, Japan.....	Sept.	4, 1901	
MYERS, CHARLES HAYWARD			
Aldrich Court, 45 Broadway, New York City.....	Aug.	5, 1868	
MYERS, EDMUND TROWBRIDGE DANA			
Pres., Richmond, Fredericksburg & Potomac R. R. Co., Wash- ington Southern Ry., Richmond, Va.....	May	2, 1888	

		Date of Membership.
MYERS, EDMUND TROWBRIDGE DANA, Jr.	{ Jun.	May 2, 1888
Civ. Engr., Wm. R. Trigg Co., Richmond, Va.....	{ M.	June 7, 1899
MYERS-BESWICK, WILLIAM BESWICK		
14 Victoria St., Westminster, S. W., London, England.....	Jan.	3, 1894
NELLES, GEORGE THOMAS		
U. S. Asst. Engr., 722 Hickox Bldg., Cleveland, Ohio.....	Oct.	3, 1888
NEWELL, FREDERICK HAYNES		
Hydrographer, U. S. Geological Survey, Washington, D. C....	Dec.	5, 1900
NEWMAN, ROBERT MORRIS		
Jackson, Mich.....	May	6, 1874
NICHOL, JOHN	{ Assoc.	Oct. 2, 1872
21 Quincy St., Chicago, Ill.....	{ M.	April 5, 1876
NICHOLS, EDWIN JAY		
Asst. Engr., St. L. S. W. Ry. Co., 502 West Third Ave., Pine Bluff, Ark.....	Sept.	2, 1896
NICHOLS, LEWIS ABEL		
Pres., Nichols Engineering & Contracting Co., 1538 Monadnock Bldg., Chicago, Ill.....	Oct.	5, 1892
NICHOLS, OTHIENI FOSTER		
Prin. Asst. Engr., New East River Bridge, 42 Gates Ave., Brooklyn, N. Y.....	June	7, 1876
NICHOLS, WILLARD ATHERTON		
Redlands, Cal.....	May	7, 1873
NICHOLSON, GEORGE BENSON		
Chf. Engr., C. N. O. & T. P. Ry. Co, 530 Garrard St., Covington, Ky.....	May	1, 1878
NICOLLS, WILLIAM JASPER		
1018 South 49th St., Philadelphia, Pa.....	June	5, 1878
NICOLSON, GEORGE LLIWELLYN		
Gen. Mgr., C. & O. Canal, Washington, D. C.....	Dec.	5, 1894
NOBLE, ALFRED	{ Jun.	Sept. 2, 1874
18 Broadway, New York City.....	{ M.	April 3, 1878
NOBLE, THERON AUGUSTUS		
Hydr. Engr., Room 7, Downs Blk., Seattle, Wash.....	June	2, 1897
N. NORTH, EDWARD P.		
220 West 57th St., New York City.....	Dec.	4, 1867
NORTHRUP, HERBERT FRANKLIN		
Div. Engr., M. & S. E. Ry., Marquette, Mich.....	Jan.	6, 1892
NORTON, ALBERT GRAY		
Asst. Engr., Mississippi Div., B. & O. S. W. R. R., 9 Hebron St., Washington, Ind.....	Dec.	4, 1901
NORTON, JOHN TALCOTT		
Div. Engr., The Cuba Co., Eastern Div., San Luis, Cuba.....	Nov.	3, 1897
NOSTRAND, PETER ELBERT		
Cons. Engr. and City Surv., 81 Fulton St., New York City.....	{ Assoc. M.	Sept. 7, 1892 Mar. 6, 1895
NOYES, ELLIS BRADFORD	{ Jun.	July 7, 1880
Civ. Engr.'s Office, U. S. Navy Yard, Norfolk, Va.....	{ M.	Oct. 2, 1889

Date of
Membership.

OAKLEY, FRANK THOMPSON (Oakley & Tonson, Civ. Engrs.); Chf. Engr., The Toledo & Western Ry., 1014 The Spitzer, Toledo, Ohio.	{ Assoc. M. M.	Feb. 6, 1895 June 6, 1900
OCKERSON, JOHN AUGUSTUS Mem., Mississippi River Comm., 1119 Fullerton Bldg., St. Louis, Mo.		July 7, 1880
ODELL, FREDERICK SYLVESTER Port Chester, N. Y.		Mar. 5, 1884
O'DONNELL, JOHN PATRICK Palace Chambers, Westminster, London, S. W., England.		July 5, 1893
O'HANLY, JOHN LAWRENCE POWER Cons. Engr., Ottawa, Ont., Canada.		Sept. 5, 1883
OLCOTT, EBEN ERSKINE Min. Engr., 36 Wall St., New York City.		July 5, 1893
OLMSTED, FRANK HENRY (Quinton, Olmsted & Sanders, Cons. Engrs.), 219 Laughlin Bldg., Los Angeles, Cal.		Feb. 7, 1900
OLNEY, ALFRED CLARENCE 27 Pitt St., Charleston, S. C.	{ Jun. M.	April 30, 1895 Nov. 2, 1898
OLNEY, LAFAVETTE 99 Nassau St., New York City.		Oct. 7, 1868
OPDYKE, STACY BROWN, Jr. Engr. and Contr., 1222 Belmont Ave., Philadelphia, Pa.		Feb. 2, 1876
ORANGE, JAMES (Leigh & Orange), Hong Kong, China.		Dec. 3, 1890
O'ROURKE, JOHN FRANCIS (<i>Director.</i>) Cons. and Contr. Engr., Park Row Bldg., 21 Park Row, New York City.		April 2, 1884
OSBORN, FRANK CHITTENDEN (<i>Director.</i>) Pres., The Osborn Engineering Co., Osborn Bldg., Cleveland, Ohio.		Oct. 3, 1888
OSGOOD, JOSEPH OTIS Chf. Engr., Central R. R. Co. of N. J., Jersey City, N. J. (Res., Plainfield, N. J.).	{ Jun. M.	May 3, 1876 Mar. 5, 1879
OSTROM, JOHN NELSON 1525 Frick Bldg., Pittsburgh, Pa.		Nov. 5, 1890
OSTRUP, JOHN CHRISTIAN Pres. and Chf. Engr., Beacon Engineering Co., 7 Water St., Boston, Mass.	{ Assoc. M. M.	Mar. 4, 1896 Mar. 1, 1899
OTAGAWA, MASAYUKI Ashio Copper Mines, Shimotsuke, Japan.		Jan. 2, 1895
OTIS, GEORGE ELLISON Div. Engr., Ft. S. & W. Ry., Fort Smith, Ark.		July 3, 1895
OWEN, JAMES Cons. Engr., 196 Market St., Newark, N. J.		Sept. 15, 1869
OWENS, HENRY KINDER Seattle, Wash.		Mar. 6, 1889

Date of
Membership.

OXHOLM, THEODOR SMIDT

Prin. Asst. Engr., Dept. of Public Works, Borough of Richmond, West New Brighton, N. Y. Nov. 3, 1897

PACKARD, RALPH GOODING

(R. G. & J. S. Packard) 130 Pearl St., New York City..... Feb. 17, 1869

PAGET, EDMUND WINTER

City Engr.'s Office, Portland, Ore. June 5, 1901

PAINE, ARTHUR BICKLEY

317 Main St., Springfield, Mass. Sept. 6, 1882

PAINE, CHARLES (*Past-President.*)

Cons. Civ. Engr., 32 Park Pl., New York City (Res., Tenafly, N. J.).... Dec. 4, 1867

PALMER, CORNELIUS

Engr., Peninsula Div., C. & N. W. Ry., Escanaba, Mich. Nov. 2, 1887

PALMER, FREDERICK

Neath, South Wales, Great Britain Oct. 4, 1899

PARDEE, JAMES THOMAS

Asst. Chf. Engr., Dept. of Public Works (Res., 196 Dodge St.), Cleveland, Ohio. { Assoc. M. June 5, 1895
M. June 5, 1901

PARET, MILNOR PECK

Chf. Engr., The Kansas City, Mexico & Orient Ry. Co., 101 New England Bldg., Kansas City, Mo. Sept. 2, 1885

PARKER, ANDREW McCLEAN

Engr. and Contr., Ryan & Parker, Room 1901, Park Row Bldg., New York City Mar. 6, 1889

PARKER, CHARLES JEREMIAH

Div. Engr., R. W. & O. Div., N. Y. C. & H. R. R. R., Watertown, N. Y. Feb. 7, 1900

PARKER, HAROLD

Clinton, Mass. June 7, 1899

PARKER, MAURICE STILES

Engr. and Contr., P. O. Box 398, East Las Vegas, N. Mex. Feb. 5, 1890

PARKER, WILLIAM

Div. Engr., Boston & Albany R. R., Room 372, South Station, Boston, Mass. Mar. 7, 1900

PARKHURST, HENRY WILLIAMS

Engr. of Bridges and Bldgs., I. C. R. R., 1 Park Row, Chicago, Ill. Sept. 5, 1877

PARMLEY, WALTER CAMP

Engr. in Chg. of Sewers, Dept. of Public Works (Res., 19 Brt St.), Cleveland, Ohio. { Assoc. M. April 1, 1896
M. June 1, 1898

PARSONS, HARRY DE BERKELEY

Cons. Engr., 22 William St., New York City, and Prof. of Steam Eng., Rensselaer Polytechnic Inst., Troy, N. Y. Feb. 3, 1897

PARSONS, HENRY CUYLER

(Parsons & Melius, Civ. Engrs.) Tweddle Bldg., Albany, N. Y. Oct. 6, 1886

Date of
Membership.

PARSONS, WILLIAM BARCLAY				
Chf. Engr., Rapid Transit Comm., 320 Broadway, New York City.....		Jun. M.	June 7, 1882 Nov. 2, 1887	
PASCHKE, THEODORE				
335 Central Park West, New York City.....		Mar.	7, 1894	
PATTEN, HENRY BENJAMIN				
208 West 22d St., Cheyenne, Wyo.....		Jan.	4, 1888	
PATTERSON, JOHN AUSTIN				
Cons. Engr., 420 Walnut St., Philadelphia, Pa.....		May	2, 1900	
PATTERSON, JOHN CURTIS				
Chf. Engr. for Govt. of Ecuador, Guayaquil & Quito Ry. Co., Guayaquil, Ecuador.....		Oct.	2, 1889	
PEARL, JAMES WARREN				
Engr. and Contr., Benton Harbor, Mich.....		Jan.	2, 1889	
PEARSON, FRED STARK				
621 Broadway, New York City.....		Nov.	3, 1897	
PEARSONS, GALEN W.				
1611 Baltimore Ave., Kansas City, Mo.....		Jan.	6, 1875	
PEARY, ROBERT EDWIN				
U. S. N., 2014 Twelfth St., N. W., Washington, D. C.....		Mar.	3, 1886	
PEGRAM, GEORGE HERNDON (<i>Director.</i>)		Jun. M.	April 7, 1880 Jan. 3, 1883	
Chf. Engr., Manhattan Ry. Co., 195 Broadway, New York City				
PENCE, WILLIAM DAVID				
Prof. of Civ. Eng., Purdue Univ., Lafayette, Ind.....		Oct.	4, 1899	
PERKINS, CHARLES PENROSE		Jun. M.	Feb. 3, 1875 April 5, 1882	
2005 DeLancey St., Philadelphia, Pa.....				
PERRILLIAT, ARSÈNE				
Mem., Board of State Engrs. of Louisiana, New Orleans, La.....		Assoc. M. M.	June 7, 1893 April 5, 1899	
PETERSON, PETER ALEXANDER				
Chf. Engr., Canadian Pacific Ry., Montreal, Que., Canada....		Jan.	5, 1876	
PETTIGREW, THOMAS				
Clarksburg, W. Va		Oct.	4, 1893	
PEW, ARTHUR				
Pres. and Chf. Engr., The South Georgia Engineering Co., Bainbridge, Ga.....		Dec.	2, 1885	
PHILLIPS, ASA EMORY		Jun.	Nov. 5, 1891	
Asst. Engr., Eng. Dept., D. C., 2d and N Sts., S. E., Washington, D. C.....		Assoc. M. M.	Dec. 7, 1898 Sept. 4, 1901	
PHILLIPS, HIRAM				
Pres., Board Public Impvts., City Hall, St. Louis, Mo.....		Assoc. M. M.	Jan. 3, 1894 Nov. 3, 1897	
PHILLIPS, JOSEPH LESLIE				
Director of Compañía de Inguarán, Otega 28, City of Mexico, Mexico		Nov.	3, 1897	
PICKETT, WILLIAM DOUGLAS				
Four Bear, Big Horn Co., Wyo.....		July	6, 1853	

Date of
Membership.

PIERCE, HENRY			
Div. Engr., C. & O. Ry., Ashland, Ky.....		Dec. 5, 1894	
PIERCE, WILLIAM THOMAS			
Chf. Engr., Met. Park Comm., 14 Beacon St., Boston, Mass....	May 6, 1896		
PIERSON, GEORGE SPENCER			
Civ., Hydr. and San. Engr., Kalamazoo, Mich.....	June 5, 1889		
PIHL, OLAF RIDLEY			
812 Lewis Blk., Pittsburg, Pa.....	Oct. 2, 1889		
PLIMPTON, ARTHUR LESLIE			
Civ. Engr. in Chg. of Dept. of Civ. Eng., Bureau of Surface Lines, Boston Elevated Ry. Co., 101 Milk St., Boston, Mass..	May 6, 1896		
PLYMPTON, GEORGE WASHINGTON			
Prof. of Civ. Eng., Pol. Inst., Brooklyn; Director of Cooper Union Schools, New York City; 127 Herkimer St., Brooklyn, N. Y.....	Jan. 29, 1868		
POETSCH, CHARLES JULIUS			
City Engr. and Pres., Board of Public Works, Milwaukee, Wis.....	Jun. M.	May 4, 1881 May 2, 1883	
POLHEMUS, JAMES SUYDAM			
U. S. Asst. Engr., U. S. Engr. Office, Portland, Ore.....	Oct. 3, 1894		
PORTER, ALBERT HEZEKIAH			
403 The Osborn, 275 Prospect St., Cleveland, Ohio.....	Mar. 6, 1889		
PORTER, DWIGHT			
Prof. of Hydr. Eng., Mass. Inst. of Technology, Boston, Mass.	Oct. 4, 1893		
POST, GEORGE BROWNE			
33 East 17th St., New York City.....	Sept. 2, 1896		
POST, WALTER A.			
Gen. Supt., Newport News Ship-Building & Dry Dock Co., Newport News, Va.....	Mar. 1, 1893		
POTTER, HENRY WITBECK			
Care, Westinghouse Co., 120 Broadway, New York City.....	Dec. 5, 1888		
POWELL, AMBROSE VINCENT			
Cons. Civ. Engr., Chamber of Commerce Bldg., Chicago, Ill....	Feb. 6, 1901		
POWELL, ARCHIBALD OLIN			
Asst. Engr., U. S. Engr. Office, 418 Globe Bldg., St. Paul, Minn.	Mar. 2, 1898		
POWELL, CHARLES FRANCIS			
Maj., Corps of Engrs., U. S. A., New London, Conn.....	Oct. 3, 1888		
POWER, GEORGE COFFIN			
Ventura, Cal.....	Feb. 1, 1893		
POWERS, JOSEPH ALLEN			
Chairman, Executive Com., Hudson Valley Ry., Waterford, N. Y.....	Jun. M.	April 2, 1884 Sept. 3, 1890	
POYNOR, DAVID ASHLEY			
Athens, Tex.....	June 1, 1892		
PRATT, MASON DELANO			
Engr. in Chg. of erection of new shops for Frog and Switch Dept., The Pennsylvania Steel Co., Steelton, Pa.....	Jun. Assoc. M. M.	Sept. 5, 1888 Feb. 3, 1897 April 3, 1901	

PRATT, WILLIAM ABBOTT	Prof. of Mech. and Elec. Eng., Delaware College (Res., 1321 Gilpin Ave.), Wilmington, Del.....	July 5, 1882
PRATT, WILLIAM ARTHUR	Engr. of Bridges, Pennsylvania R. R. Co., Broad St. Station, Philadelphia, Pa.....	Dec. 4, 1895
PREVOST, SUTHERLAND MALLET	Third Vice-Pres., Pennsylvania R. R., Philadelphia, Pa.....	Jan. 6, 1875
PRICE, WILLIAM GUNN	Engr. and Asst. Mgr., Peckham Mfg. Co., Kingston, N. Y.....	April 3, 1895
PRICHARD, HENRY SEWALL	Statistician, American Bridge Co., Pencoyd, Pa.....	Jan. 2, 1895
PRINCE, EDWARD	Cons. Engr., Quincy, Ill.....	Jun. Feb. 6, 1878 M. Nov. 1, 1882
PRINCE, GEORGE THOMAS	Hydr. and San. Engr., Room 27, Nebraska Nat'l. Bank Bldg., Omaha, Nebr.	April 4, 1894
PRINDLE, FRANKLIN COGSWELL	Civ. Engr., U. S. N. (<i>Retired</i>), Bakersfield, Cal.....	Mar. 4, 1874
PRIOR, CHARLES HENRY	902 New York Life Bldg., Minneapolis, Minn.....	Mar. 1, 1882
PROBASCO, SAMUEL R.	179 Washington St., Brooklyn, N. Y.....	Nov. 18, 1868
PROUT, HENRY GOSLEE	Editor, <i>Railroad Gazette</i> , 32 Park Pl., New York City....	Assoc. Nov. 6, 1872 M. Sept. 3, 1879
PURDON, CHARLES DE LA CHEROIS	Chf. Engr., Frisco System, 644 Century Bldg., St. Louis, Mo....	Mar. 3, 1886
PURDY, CORYDON TYLER	Chf. Engr., George A. Fuller Co., 137 Broadway, New York City.....	Jun. Feb. 2, 1887 M. Dec. 6, 1893
R. QUIMBY, HENRY HODGE	Quimby Engineering Co., 915 Ridge Ave., Philadelphia, Pa....	Sept. 3, 1890
QUINETTE DE ROCHEMONT, Baron EMILE THEODORE	Inspecteur Général des Ponts et Chaussées; Directeur des Phares et Balises, 18 Rue de Marignan, Paris, France.....	Jan. 3, 1894
QUINTON, JOHN HENRY	(Quinton, Olmsted & Sanders, Cons. Engrs.), Los Angeles, Cal.	Feb. 7, 1900
QUINTUS, JOHN CHARLES	Prin. Asst. U. S. Engr., U. S. Engr. Office, 540 Federal Bldg., Buffalo, N. Y.....	Jan. 2, 1889
RAASLOFF, HARALD DE	18 Burling Slip, New York City.....	Jun. Dec. 3, 1884 M. July 3, 1895
RADENHURST, WILLIAM NAPIER	Asst. Engr., Water-Works, Rochester, N. Y.....	Jun. July 7, 1875 M. July 7, 1880
RAFTER, GEORGE W.	63 Kenwood Ave., Rochester, N. Y.....	April 2, 1884

		Date of Membership.
RAMSEY, JOSEPH, Jr. (<i>Director.</i>)		
Pres., Wabash R. R. Co.; Pres., Wheeling & Lake Erie R. R. Co., St. Louis, Mo.....	May 1, 1889	
RANDOLPH, BEVERLY STROTHER		
Min. Supt., Consolidation Coal Co., Frostburg, Md.....	May 2, 1888	
RANDOLPH, LINGAN STROTHER		
Prof., Mech. Eng., Virginia Polytechnic Inst., Blacksburg, Va..	Jan. 2, 1889	
RAYMOND, CHARLES WALKER		
Lt.-Col., Corps of Engrs., U. S. A., Witherspoon Bldg., Philadelphia, Pa.....	June 1, 1892	
RAYMOND, CHARLES WARD		{ Jun. Nov. 7, 1877
Care, Crystal Lake G. M. Co., Cisco, Placer Co., Cal....	M. April 7, 1886	
RAYMOND, WILLIAM GALT		
Prof. of Geodesy, Road Eng. and Topographical Drawing, Rensselaer Polytechnic Inst., Troy, N. Y.....	Oct. 3, 1894	
REA, SAMUEL		
Fourth Vice-Pres., Penna. R. R. Co., Broad St. Station, Philadelphia, Pa.....	June 4, 1884	
READ, ROBERT LELAND		
32 East 3d St., Cincinnati, Ohio.....	Sept. 2, 1874	
REED, DAVID ABELL		
312 Providence Bldg., Duluth, Minn.....	Mar. 4, 1896	
REED, MELVILLE EMERSON		
Div. Engr., G. N. Ry., Jennings, Mont.....	Mar. 6, 1901	
REED, WILLIAM BOARDMAN		
Engr., M. of W., Met. St. Ry. Co., 621 Broadway, New York City.....	{ Assoc. M. Feb. 6, 1895 M. May 1, 1901	
REEVES, DAVID		
Pres., The Phoenix Iron Co. and Phoenix Bridge Co., 410 Walnut St., Philadelphia, Pa.....	{ Jun. April 1, 1874 M. May 3, 1882	
RENshaw, ALFRED HOWARD		
Pres., Standard Signal Co., Troy, N. Y.....	June 1, 1898	
REYNDEES, JOHN VAN WICHEREN		
Supt., Bridge and Const. Dept., Pennsylvania Steel Co. (Res., 115 Pine St.), Harrisburg, Pa.....	{ Assoc. M. June 1, 1892 M. Mar. 3, 1897	
RICE, GEORGE S.		
Deputy Chf. Engr., Rapid Transit R. R. Commrs., 320 Broadway, New York City.....	Feb. 1, 1882	
RICE, LEWIS FREDERICK		
Archt. and Civ. Engr.; Asst. Engr., Am. Bell Telephone Co., 125 Milk St., Boston, Mass.....	Jan. 2, 1889	
RICE, WALTER PERCIVAL		
(The Walter P. Rice Engineering Co., Civ. and Cons. Engrs.)		
732 Society for Savings, Cleveland, Ohio.....	Mar. 6, 1889	
RICH, WATSON WELLMAN		
Care, American Consul-General, Shanghai, China.....	Sept. 5, 1883	
RICHARDS, ALEERT LENNOX		
U. S. Asst. Engr., Rock Island, Ill.....	Jan. 2, 1901	

Date of
Membership.

RICHARDS, HUGH TUDOR			
Chf. Engr., San Diego Eastern Ry., 1941 Lovelace Ave., Los Angeles, Cal.....		Oct. 6, 1886	
RICHARDS, JOSEPH THOMAS			
Engr., M. of W., Penna. R. R. Co., Broad St. Station, Philadelphia, Pa.....		April 4, 1894	
RICHARDSON, B. FRANK.			
Cons. Civ. Engr., 2217 Federal St., Philadelphia, Pa.....		July 1, 1885	
RICHARDSON, HENRY BROWN (<i>Director.</i>)			
Chf. State Engr., New Orleans, La.....		May 7, 1879	
RICHARDSON, THOMAS FRANKLIN			
Engr., Dam and Aqueduct Dept., Met. Water Board, Clinton, Mass.....		Nov. 4, 1885	
RICKER, GEORGE ALFRED			
702 Ellicott Sq., Buffalo, N. Y.....	{ Assoc. M. M.	April 7, 1886 May 1, 1895 April 3, 1901	
RICKETTS, PALMER CHAMBERLAIN			
Pres. of, and Prof. of Mechanics, Rensselaer Polytechnic Inst., Troy, N. Y.....	{ Assoc. M.	Feb. 4, 1886 Oct. 5, 1887	
RICKON, FREDERIC JOHN HENRY			
Quartermaster's Dept., U. S. A., 236 Phelan Bldg., San Francisco, Cal.....		Jan. 4, 1888	
RIFFLE, ALBERT STANLEY			
Care, Excelsior Wooden Pipe Co., 204 Front St., San Francisco, Cal.....		May 7, 1890	
RIFFLE, FRANKLIN			
17 Beale St., San Francisco, Cal.....		Nov. 7, 1888	
RIGGS, HENRY EARLE			
Civ. and Cons. Engr. (Riggs & Sherman), 613 The Nasby, Toledo, Ohio.....	{ Assoc. M. M.	Oct. 4, 1893 April 1, 1896	
RIGGS, MORRIS JOHN			
Mgr., Toledo Plant, American Bridge Co., Toledo, Ohio.....		Dec. 6, 1899	
RIPLEY, HENRY CLAY			
Cons. Engr. for River and Harbor Impvts. and Marine Constr., 523 Packard St., Ann Arbor, Mich.....		Oct. 7, 1896	
RIPLEY, JOSEPH			
U. S. Asst. Engr., Sault Ste. Marie, Mich.....		Sept. 4, 1901	
RISER, KNUD SOPHUS			
Pres. and Engr., Grand Rapids Bridge Co., Grand Rapids, Mich.		Feb. 3, 1892	
ITCHIE, JAMES			
Cons. Engr., Grade Crossing Comm., and Ritchie & Ruple, Civ. Engts., 413 Chamber of Commerce, Cleveland, Ohio.....		Nov. 5, 1890	
RIVES, ALFRED L.			
Cobham, Albemarle Co., Va.....		Sept. 4, 1872	
RIX, EDWARD AUSTIN			
Pres., Rix Compressed Air & Drill Co., 396 Mission St., San Francisco, Cal.....		April 7, 1897	
ROBERTS, EVELYN PIERREPONT			
Civ. and Cons. Engr., 22 William St., New York City.....		May 7, 1884	

		Date of Membership.
ROBERTS, NATHANIEL		
Cons. Engr., 7 West 22d St., New York City (Res., { Assoc. M. 798 Ocean Ave., Jersey City, N. J.).....} M.	Nov. 4, 1891 May 2, 1894	
ROBERTS, PERCIVAL, JR.		
Executive Committee, U. S. Steel Corporation, 71 { Assoc. Broadway, New York City.....} M.	May 7, 1879 June 4, 1884	
ROBINSON, ALBERT ALONZO		
Pres., Mexican Central Ry. Co., Ltd., 70 Kilby St., Boston, Mass.....	May 5, 1880	
ROBINSON, ALBERT FOWLER		
Bridge Engr., A., T. & S. F. Ry. System (Res., 910 Monroe St.), Topeka, Kans.....	Nov. 2, 1887	
ROBINSON, ARTHUR WELLS		
Cons. Engr., Dept. of Public Works of Canada, 879 Dorchester St., Montreal, Que., Canada.....	Feb. 3, 1892	
ROBINSON, GEORGE HENRY		
328 Atlas Blk., Salt Lake City, Utah.....	Mar. 7, 1888	
R. ROBINSON, STILLMAN WILLIAMS		
Prof. Emeritus in Mech. Eng., Ohio State Univ.; Engr. and Expert, 1353 Highland St., Columbus, Ohio.....	Jan. 2, 1884	
ROCKWELL, SAMUEL		
Prin. Asst. Engr., L. S. & M. S. Ry. Co., Cleveland, Ohio.....	Jan. 7, 1880	
RODD, THOMAS		
Chf. Engr., Pennsylvania Lines West of Pittsburg, Pittsburg, Pa.....	Jan. 5, 1878	
ROGERS, MERRITT HARRISON		
Chf. Engr., D. & R. G. R. R., 304 Equitable Bldg. (Res., 1314 Gilpin St.), Denver, Colo.....	Jan. 2, 1890	
ROGERS, WALTER ALEXANDER		
Vice-Pres., Bates & Rogers Constr. Co., 1203 Man-{ Assoc. M. hattan Bldg., Chicago, Ill.....} M.	Sept. 10, 1891 Nov. 3, 1897 April 4, 1900	
ROGGE, JOHN CHARLES LEWIS		
Pres. and Engr., Contractors Supply Co., 198th St. and { Jun. Webster Ave., New York City.....} M.	Mar. 31, 1891 Oct. 5, 1898	
ROLLINS, JAMES WINGATE, Jr.		
(Holbrook, Cabot & Daly), 1140 Tremont Bldg., Boston, Mass... 	Nov. 7, 1900	
ROOD, HENRY MARTYN		
59 Washington St., Port Chester, N. Y.....	Dec. 3, 1890	
ROSE, CHARLES CLEMONS		
Supt., Coal Dept., The D. & H. Co., Scranton, Pa.....	April 4, 1888	
ROSENCRANS, WILLIAM HENRY		
Chf. Engr. Constr., Ind., Ill. & Iowa R. R., 714 Reaper Blk., 105 Washington St., Chicago, Ill.....	Oct. 5, 1898	
ROSENZWEIG, ALFRED		
Cons. Engr., P. O. Box 653, City of Mexico, Mexico.....	{ Jun. June 7, 1883 } M. Jan. 4, 1893	
ROSEWATER, ANDREW		
Cons. Engr., Municipal Works, 424 Bee Bldg., Omaha, Nebr... 	Oct. 3, 1883	
ROSS, ALEXANDER BELL		
Tampico, Mexico.....	May 2, 1900	

Ross, DOUGLAS WILLIAM			
State Engr. of Idaho, Boise, Idaho.....		Mar. 1, 1899	
Ross, JAMES			
Street Railway Chambers, Montreal, Que., Canada.....		Sept. 6, 1882	
ROTCHE, WILLIAM			
Pres., Union Steel & Chain Co., 53 State St., Boston, Mass.....		Mar. 5, 1873	
ROULLIER, GUSTAVE ANTHIME			
326 Amity St., Flushing, N. Y.....		Mar. 1, 1893	
R. ROWE, SAMUEL McMATH			
Civ. and Cons. Engr., 226 La Salle St., Chicago, Ill.....		Sept. 2, 1885	
ROWLAND, CHARLES BRADLEY			
The Continental Iron Works, Brooklyn, N. Y.		May 1, 1895	
ROWLAND, CHARLES LEONARD			
114 Greene St., Brooklyn, N. Y.....		Sept. 1, 1886	
ROWLAND, THOMAS FITCH			
Pres., The Continental Iron Works, Brooklyn, N. Y. (Res., 329 Madison Ave., New York City).....	M. Hon. M.	Dec. 4, 1867 Dec. 20, 1899	
ROWLAND, THOMAS FITCH, Jr.			
Secy. and Treas., The Continental Iron Works, Brooklyn, N. Y.		Sept. 1, 1886	
RUDDLE, JOHN			
Gen. Superv. of Canals, The Lehigh Coal & Navigation Co., Mauch Chunk, Pa.....		Oct. 3, 1894	
RUGGLES, WILLIAM BURROUGHS			
Asst. Engr., Dept. of Matanzas and Santa Clara, Matanzas, Cuba.		April 7, 1886	
RUNDLETT, LEONARD W.			
Cons. Engr., 309 Ryan Bldg., St. Paul, Minn.....		Sept. 5, 1883	
RUSSELL, SILAS BENT			
Asst. Engr. in Chg. Water-Works Extension, 77 East St., St. Louis, Mo.....	M.	June 4, 1884 June 1, 1887	
RUST, CHARLES HENRY			
City Engr., City Hall, Toronto, Ont., Canada.....		April 5, 1899	
RUTTAN, HENRY NORLANDE			
City Engr., Winnipeg, Man., Canada.....		Jan. 4, 1893	
SABIN, ALPHEUS TIMOTHY			
Chf. Engr., Louisville & Atlantic R. R., Irvine, Estill Co., Ky.		April 1, 1896	
SACKETT, JOHN WARREN			
U. S. Engr. Office, St. Augustine, Fla.....		May 2, 1894	
SAFFORD, ARTHUR TRUMAN			
Asst. Engr., Proprietors of Locks and Canals, 66 Broadway, Lowell, Mass.....		Sept. 6, 1899	
SAFFORD, EDWARD STANLEY			
Chihuahua, Mexico.....		Dec. 6, 1882	
SAFFORD, VINTON PUTNAM			
Supt., Mexican Northern Ry., Escalon, Chihuahua, Mexico....		July 4, 1894	
SAMPLE, JOHN HENDERSON			
Granville, Ohio.....		Oct. 6, 1886	

		Date of Membership.
SANDERSON, JAMES GARDNER		
1530 Sanderson Ave., Scranton, Pa.....	July 6, 1881	
SARLE, OLIVER PERRY, Jr.		
146 Westminster St., Providence, R. I.....	Jan. 2, 1901	
SAUNDERS, WILLIAM LAWRENCE		
Vice-Pres., The Ingersoll-Sergeant Drill Co., 26 Cortlandt St., New York City.....	Nov. 3, 1886	
SAVAGE, ALBERT CHAPMAN		
45 Broadway, New York City.....	May 4, 1881	
SAVAGE, HIRAM NEWTON		
Engr. in Chg., Sweetwater Dam and Sweetwater Water System, National City, Cal.....	Mar. 7, 1894 Oct. 7, 1896	
SAVILLE, CALEB MILLS		
Div. Engr., Distrib. Dept., Met. Water Board, 1 Ashburton Pl., Boston, Mass.....	Nov. 6, 1895 Jan. 2, 1901	
SAWYER, EDWARD		
60 Congress St., Boston, Mass. (Res., Newton, Mass.).....	Oct. 2, 1895	
SAX, PERCIVAL MOSLEY		
Engr. and Contr., 1328 Chestnut St., Philadelphia, Pa.....	Jun. Jan. 31, 1893 Assoc. M. Jan. 3, 1900 M. April 3, 1901	
SCAIFE, WILLIAM LUCIEN		
Scaife Foundry & Machine Co., Ltd., Pittsburg, Pa.....	Dec. 3, 1890	
SCHAUB, JULIUS WILLIAM		
Cons. Engr., 1649 Monadnock Blk., Chicago, Ill.....	Jun. Nov. 5, 1884 M. Oct. 6, 1886	
SCHENCK, ARCHIBALD ALEXANDER		
Div. Engr., C. & N. W. Ry., Boone, Iowa.....	Oct. 1, 1890	
SCHERMERHORN, LOUIS YOUNGLOVE		
Pres., American Dredging Co., 236 Walnut St., Philadelphia, Pa.....	May 5, 1897	
SCHERZER, ALBERT JOHN		
Santa Ana, Salvador.....	Jan. 6, 1886	
SCHMIDT, MAX EBERHARDT		
Cons. Engr., 175 West 58th St., New York City.....	May 7, 1879	
R. SCHNEIDER, CHARLES CONRAD (<i>Vice-President</i>)		
Vice-Pres., American Bridge Co., 100 Broadway, New York City.	Feb. 6, 1884	
SCHOFIELD, HIRAM ABIF		
Res. Engr., Pittsburg Testing Laboratory, Ltd., Room 906, Crozer Bldg., 1420 Chestnut St., Philadelphia, Pa.....	Oct. 7, 1896	
SCHULTZ, ALBERT LOUIS		
Mgr., Pittsburg Div., American Bridge Co., Pittsburg, Pa.....	Sept. 4, 1901	
SCHULTZE, PAUL LOUIS		
City Engr., Utica, N. Y.....	Assoc. M. Nov. 2, 1898 M. June 5, 1901	
R. SCHUYLER, JAMES DIX		
Cons. Hydr. Engr., 401 Douglas Blk., Los Angeles, Cal.....	Dec. 6, 1882	
SCOTT, ADDISON MOFFAT		
Charleston-Kanawha, W. Va.....	June 2, 1886	
SCOTT, ERNEST KAY		
Care, Illinois Steel Co., 50 Wabansia Ave., Chicago, Ill.....	Mar. 2, 1898	

		Date of Membership.
SCOVILL, EDWARD TRACY	Dansville, N. Y.....	Sept. 6, 1876
SEAMAN, HENRY BOWMAN (<i>Director.</i>)	{ Jun. June 2, 1886	
Cons. Engr., 40 Wall St., New York City.....	{ M. Dec. 7, 1887	
SEARLES, WILLIAM HENRY	Cons. Civ. Engr., Elyria, Ohio.....	July 2, 1873
SEARS, ALFRED FRANCIS	Oregon State Engr. for Irrigation, Portland, Ore.....	June 2, 1869
SEASER, JOHN WRIGHT	Vice-Pres., Wellman-Seaver Engineering Co., New England Bldg., Cleveland, Ohio.....	Nov. 6, 1901
N. SEDDON, JAMES ALEXANDER	906 Security Bldg., Chicago, Ill.....	Nov. 2, 1898
SEE, HORACE	1 Broadway, New York City.....	June 1, 1892
SELLERS, COLEMAN	1301 Stephen Girard Bldg., Philadelphia, Pa.....	May 3, 1876
SENGOKU, MITSUGU	The Kiushiu Ry., Moji, Kiushiu, Japan.....	June 4, 1890
SEYMORE, HORATIO	Chairman, Michigan Iron & Land Co. (Ltd.), Marquette, Mich.....	Jan. 3, 1873 { Assoc. M. April 7, 1880
SHAILER, ROBERT AMES	Pres., Boston Tunnel Construction Co., 23 Lewis St., East Boston, Mass.....	Mar. 3, 1880
SHAILER, IRA ALEXANDER	Contr. Engr., 27 William St., New York City.....	Jun. July 4, 1888 { M. June 5, 1895
SHANKLAND, EDWARD CLAPP	(E. C. & R. M. Shankland), Rookery Bldg., Chicago, Ill.....	Feb. 5, 1890
SHANKLAND, RALPH MARTIN	Rookery Bldg., Chicago, Ill.....	Mar. 1, 1899
SHANKS, THOMAS PEARMAN	U. S. Asst. Engr., P. O. Box 515, Louisville, Ky.....	May 2, 1888
SHANLY, JAMES MOORE	Contr. Engr., 346 Prince Arthur St., Montreal, Que., Canada...	July 6, 1887
SHAW, GRANVILLE WHEATON	U. S. Asst. Engr., P. O. Box 496, Louisville, Ky.....	Oct. 5, 1887
SHAW, SUMNER FARNHAM	173 Sixteenth St., Portland, Ore.....	Oct. 3, 1894
SHELD, JOEL HERBERT	Cons. Engr., Providence, R. I.....	Sept. 15, 1869
SHEPARD, DAVID CHAUNCEY	St. Paul, Minn.....	May 2, 1888
SHERMAN, HERBERT ELLWOOD	Asst. Engr. in Chg. of Dept. of Street Lines, City Engr.'s Office, Providence, R. I.....	Mar. 7, 1900
SHERMAN, RICHARD WILLETT	Pres., Troy Public Works Co., 1 Mann Bldg., Utica, N. Y....	Oct. 6, 1887

		Date of Membership.
SHERRED, MORRIS ROBESON	Assoc. M.	May 3, 1893
Engr. and Supt., Dept. of Water, Newark, N. J....	{ M.	May 6, 1896
SHIRAISHI, NAOJI		
71 Miyamura-cho, Azabu, Tokyo, Japan.....		Oct. 4, 1899
SHIRREFFS, REUBEN		
Chf. Engr., Virginia Electrical Ry. & Development Co., Richmond, Va.....		June 4, 1890
SHMELEFF, THEODOR SEMENOVITCH		
Engr., Russian Imperial Civil Service, Novorossiisk (Caucasus), Russia		Sept. 7, 1892
SIBERT, WILLIAM LUTHER		
Capt., Corps of Engrs., U. S. A., P. O. Box 1240, Pittsburg, Pa.		June 2, 1897
SIMPSON, GEORGE FREDERIC		
Asst. Engr., Rapid Transit R. R. Comm., 189 West 136th St., New York City.....		Mar. 2, 1887
SIMPSON, GEORGE HUME		
6723 McPherson St., Pittsburg, Pa.....		Oct. 6, 1880
SIMS, ALFRED VARLEY		
Prof. of Civ. Eng., Univ. of Iowa, Iowa City, Iowa.....		Mar. 4, 1896
SINCLAIR, FRANK OSCAR		
Burlington, Vt.....		Nov. 6, 1901
SJÖSTRÖM, IVAR LUDWIG	{ Jun.	Sept. 6, 1892
Treas., The Lawrence Dye Works Co., Lawrence, Mass..	{ M.	Sept. 1, 1897
SKILTON, GEORGE STEELE		
Asst. Engr., Dept. Water Supply, New York City (Res., Rockville Center, N. Y.).....		Sept. 7, 1881
SKINNER, FRANK WOODWARD		
Editorial Staff, <i>The Engineering Record</i> , 100 William St., New York City.....		Sept. 1, 1886
SLATAPER, FELICIAN		
Via S. Vito 20, Trieste, Austria.....		Sept. 15, 1869
SLOAN, DAVID		
Chf. Engr. of Constr., I. C. R. R., 1 Park Row, Chicago, Ill....		Jan. 1, 1896
SLOCUM, CHARLES MILLS		
City Engr.'s Office, Springfield, Mass.....		May 5, 1897
SMITH, ALBERT MATHER		
Supt., 18th St. Station, Consolidated Gas Co., 18th St. and Tenth Ave., New York City.....		May 5, 1886
SMITH, BENJAMIN BURGH		
Asst. Light House Engr., Custom House, Charleston, S. C.....		Nov. 7, 1888
SMITH, EDWIN FOSTER		
Cons. Hydr. Engr., 4102 Locust St., Philadelphia, Pa.....		June 5, 1895
SMITH, EUGENE RAYMOND	{ Jun.	May 2, 1888
Islip, Suffolk Co., N. Y.....	{ M.	May 1, 1901
SMITH, HENRY CLEMENT		
Engr., Central Div., P., W. & B. R. R., Media, Pa.....		Oct. 2, 1901
SMITH, HENRY DEWITT		
Gen. Foreman, B. & B., and W. S. Depts., So. Div., K. C. S. Ry. Co., Texarkana, Tex.....		Dec. 6, 1893

SMITH, JONAS WALDO			
Engr. and Supt., The East Jersey Water Co., 107 Washington St., Paterson, N. J.....	Assoc. M. M.	Oct. 5, 1892 April 5, 1899	
SMITH, JOSEPH SHUTER			
Care Robert S. Perry, Cave Spring, Ga.....		April 1, 1874	
SMITH, LEONARD CHARLES LINDSAY			
Engr. in Chg. of Water Supply, Borough of Queens, 59 Woolsey St., Long Island City, N. Y.....		Mar. 6, 1901	
SMITH, MILLER ARMSTRONG			
Care, The Cuba Co., 80 Broadway, New York City.....		Oct. 6, 1886	
SMITH, OBERLIN			
Pres., Ferracute Machine Co., "Lochwold," Bridgeton, N. J....		Sept. 3, 1884	
SMITH, T. GUILFORD			
9 German Ins. Bldg., Buffalo, N. Y.....		Sept. 6, 1871	
SMITH, WILLIAM CHARLES			
2010 Terrace Park Ave., St. Paul, Minn.....		Sept. 4, 1901	
SMITH, WILLIAM SOOY			
Stock Exchange Bldg., Chicago, Ill.....		Jan. 17, 1872	
SMOOT, EDGAR KENNETH			
40 Montgomery St., San Francisco, Cal.....		Feb. 2, 1898	
SNOOK, THOMAS EDWARD			
261 Broadway, New York City.....		Mar. 3, 1897	
SNOW, CHARLES HENRY			
Dean, School of Applied Science, New York University, New York City.....	Assoc. M. M.	Feb. 1, 1893 Sept. 2, 1896	
SNOW, JONATHAN PARKER			
Bridge Engr., B. & M. R. R., Boston, Mass.....		June 3, 1885	
SNOW, WILLIAM PLINY			
335 Lexington St., Auburndale, Mass.....		Feb. 5, 1902	
SNYDER, CHRISTOPHER HENRY			
Honolulu Representative of Milliken Bros., New York, P. O. Box 678, Honolulu, Hawaiian Islands.....			Oct. 2, 1901
SNYDER, GEORGE DUNCAN			
Burma Oil Co., Rangoon, Burma, India.....	Assoc. M. M.	Nov. 6, 1895 Sept. 4, 1901	
SOMERVILLE, ROBERT			
Asst. Chf. Engr., Board of Mississippi Levee Commrs., Greenville, Miss.....		June 1, 1887	
SONNE, OTTO			
(P. O. Box 3051), 68 Devonshire St., Boston, Mass.....		Sept. 7, 1887	
SOOYSMITH, CHARLES			
Cons. Engr., 71 Broadway, New York City.....		May 5, 1886	
SORZANO, JULIO FEDERICO			
Cons. Engr., 33 Broadway, New York City.....		Sept. 3, 1884	
SOULE, HOWARD			
Cons. Engr., Syracuse, N. Y.....		Mar. 17, 1869	
SPALDING, FREDERICK PUTNAM			
Prof. of Civ. Eng., Univ. of State of Missouri, Columbia, Mo... SPENCER, SAMUEL		Dec. 2, 1891	
80 Broadway, New York City.....		Sept. 2, 1885	

Date of
Membership.

MEMBERS.

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Date of
Membership.

STEELE, HENRY MAYNADIER	{ Assoc. M. Chf. Engr., Central of Georgia Ry. Co., Savannah, Ga.	April 5, 1893 Dec. 6, 1899
STEPHENS, CLINTON F.	M.	
Mgr., Mine La Motte Estate, Mine La Motte, Mo.	Sept. 5, 1877	
STERN, EUGENE WASHINGTON	Cons. Engr., 1133 Broadway, New York City	Mar. 3, 1897
STEVENS, FRANK STODDARD	Supt., Reading and Lebanon Divs., Philadelphia & Reading Ry., Reading, Pa.	Oct. 3, 1883
STEVENS, HORACE EDWARD	Engr. and Contr., Care, Winston Bros., Minneapolis, Minn.	Jun. 1, 1876 M. April 4, 1888
STEVENS, JOHN FRANK	Chf. Engr., G. N. Ry., St. Paul, Minn.	June 6, 1887
STEWART, JOHN MUIRHEAD	Asst. Engr., Dept. of Docks and Ferries, East 24th St. Office, New York City	Mar. 2, 1887 M. Jan. 4, 1888
STILLWELL, LEWIS BUCKLEY	Elec. Director, Rapid Transit Subway Constr. Co.; Cons. Elec. Engr., Manhattan Ry. Co., Park Row Bldg., New York City	Oct. 2, 1901
STITES, ARCHER COCHRAN	Care, Joseph T. Ryerson & Son, 18 Milwaukee Ave., Chicago, Ill.	Jun. 3, 1890 Assoc. M. May 4, 1891 M. May 6, 1896
STODDARD, GEORGE CALEB	Civ. and San. Engr., 215 West 125th St., New York City	April 4, 1900
N. STONE, EDWARD HERBERT	Chf. Engr., East Indian Ry., Calcutta, India	Dec. 5, 1888
STOREY, WILLIAM BENSON, Jr.	Chf. Engr., A. T. & S. F. Ry., Topeka, Kans.	Jan. 2, 1889
STOWELL, CHARLES FREDERICK	(Stowell & Cunningham, Civ. Engrs.), 51 State St., Albany, N. Y.	April 4, 1888
STRACHAN, JOSEPH	Asst. Engr., Dept. of Water Supply (Res., 352 Putnam Ave.), Brooklyn, N. Y.	May 4, 1892 M. May 4, 1898
STROBEL, CHARLES LOUIS	Cons. and Contr. Engr., 1744 Monadnock Blk., Chicago, Ill.	Dec. 3, 1879
STRONG, MASON ROMEYN	Bridge Engr., Erie R. R. Co., Chicago & Erie R. R. Co., New York, Susquehanna & Western R. R. Co., 237 Lexington Ave., Passaic, N. J.	Mar. 6, 1901
STUART, ALFRED ALLEN	Engr. and Mgr. for M. P. Davis, Contr., Substructure, Quebec Bridge, Sillery, Que., Canada	Oct. 7, 1891
STUART, FRANCIS LEE	Asst. Engr., B. & O. R. R., 1515 Thirty-first St., Washington, D. C.	May 3, 1899

Date of
Membership.

STUBBS, LINTON WADDELL			
Monroe, La.....		Oct. 3, 1888	
STURTEVANT, CARLETON WILLIAM			
Box 324, Vicksburg, Miss.....		Oct. 2, 1901	
SULLIVAN, JOHN G.			
Div. Engr., Constr. Dept., Canadian Pacific Ry., Drawer E, Trail, B. C., Canada.....		Sept. 6, 1899	
SUMNER, HORACE AUGUSTUS			
Chf. Engr., El Paso & Northeastern Ry., and Alamogordo & Sacramento Mountain Ry., Alamogordo, N. Mex.....		Oct. 4, 1899	
SUNDSTROM, CARL ALFRED			
Surv. and Regulator, 8th Survey Dist., Dept. of Public Works, Philadelphia; Office, 4444 Main St., Manayunk, Philadelphia, Pa.....		Oct. 3, 1894	
SUTER, CHARLES RUSSELL			
Col., Corps of Engrs., U. S. A., Army Bldg., 39 Whitehall St., New York City.....		April 1, 1896	
SWAIN, GEORGE FILLMORE (Director.)			
Prof. of Civ. Eng., Mass. Inst. Tech.; Engr., Mass. R. I. Assoc. R. Comm.: Mem., Boston Transit Comm.; Mass. M. Inst. Tech., Boston, Mass.....		Sept. 5, 1883 Mar. 2, 1892	
SWEET, ELNATHAN			
Cons. Engr., 51 State St., Albany, N. Y.....		Nov. 6, 1878	
SWENSSON, EMIL			
Cons. and Constr. Engr., Frick Bldg., Pittsburg, Pa.....		June 7, 1893	
SYMONS, THOMAS WILLIAM			
Maj., Corps of Engrs., U. S. A., Federal Bldg., Buffalo, N. Y... Oct. 3, 1894			
TALBOT, ARTHUR NEWELL			
Prof. of Municipal and San. Eng., Univ. of Illinois, Urbana, Ill.....		April 4, 1888	
TALBOTT, HARRY ELSTNER			
Civ. Engr. and Contr., Dayton, Ohio.....		June 6, 1900	
TATNALL, GEORGE			
Asst. Engr., P. W. & B. R. R. Div., P. R. R., 902 Adams St., Wilmington, Del.....		May 3, 1899	
TAUSSIG, HUBERT PRIMM			
Civ. and Cons. Engr., 1211 Chemical Bldg., St. Louis, Mo.....		Oct. 3, 1894	
TAYLOR, EDWARD BALLINGER			
Fourth Vice-Pres., Pennsylvania Lines West of Pittsburg, 1003 Penn Ave., Pittsburg, Pa.....		Sept. 3, 1884	
TAYLOR, HARRY			
Capt., Corps of Engrs., U. S. A., P. O. Box 5346, Boston, Mass..		Oct. 7, 1896	
TAYLOR, JAMES TOWNSEND			
Cons. Hydr. Engr., Honolulu, Hawaiian Islands.....		Jan. 3, 1894	
TAYLOR, LUCIAN ARNOLD			
Cons. Engr., 719 Tremont Bldg., Boston, Mass.....		Nov. 4, 1891	

TAYLOR, NORTON LONGSTRETH			
City Engr., Tacoma, Wash.....		Feb. 4, 1891	
TAYLOR, THOMAS ULVAN	{ Assoc.	Jan. 31, 1893	
Prof. of Civ. Eng., Univ. of Texas, Austin, Tex....	{ Assoc. M. M.	Oct. 2, 1895 Oct. 2, 1901	
TAYLOR, WILLIAM DANA			
Prof., Railway Eng., Univ. of Wisconsin, 415 Wis. Ave., Madison, Wis.		Mar. 1, 1899	
TAYS, EUGENE AUGUSTUS HOFFMAN			
Mgr., Anglo-Mexican Mining Co., Ltd., San José de Gracia, Sinaloa, Mexico.....		April 6, 1898	
TEMPLE, JOHN CHARLES			
Cor. Walnut Lane and Green St., Germantown, Philadelphia, Pa.		May 4, 1898	
TEMPLE, ROBERT HENRY			
1011 East Marshall St., Richmond, Va.....		May 6, 1885	
TEMPLE, WILLIAM HENRY GILES			
Civ. and Hydr. Engr., 75 Westminster St., Providence, R. I....		Feb. 3, 1892	
TERRY, EDWARD CLINTON			
Hartford, Conn.....		Feb. 6, 1895	
THACHER, EDWIN			
Cons. Engr. and Mem., Concrete-Steel Engineering Co., Park Row Bldg., New York City.....		Feb. 17, 1869	
THACKRAY, GEORGE EDWARD	{ Jun.	Sept. 6, 1882	
Structural Engr., Cambria Steel Co., Johnstown, Pa....	{ M.	April 7, 1886	
THAYER, RUSSELL			
The United Gas Improvement Co., Broad and Arch Sts., Phila- delphia, Pa.....		Dec. 6, 1882	
N. THOMAS, BENJAMIN FRANKLIN			
415 Custom House, Cincinnati, Ohio.....		April 6, 1887	
THOMAS, GEORGE EDWARD			
Hotel Maryland, Annapolis, Md.....		Oct. 5, 1898	
THOMPSON, BENJAMIN			
Office, 31 First Nat'l Bank Bldg., Chattanooga, Tenn. (Res., 210 Bailey Ave., Highland Park, Tenn.).....		July 3, 1889	
THOMPSON, ELLIS DUNN			
Prin. Asst. Engr., U. S. Eng'r's. Office, 815 Witherspoon Bldg., Philadelphia, Pa.....		Feb. 1, 1899	
THOMPSON, GAYLORD			
Gen. Mgr., Newcastle Traction Co., Newcastle Electric Co., Lawrence Gas Co., Newcastle, Pa.....		April 2, 1890	
THOMPSON, SAMUEL CLARENCE			
Prin. Asst. Engr., Dept. of Highways, Borough of the Bronx, 177th St. and Third Ave. (Res., 950 East 166th St.), New York City.....		Feb. 6, 1889	
THOMPSON, WILLIAM ANDREW			
U. S. Asst. Engr., La Crosse, Wis.....		Oct. 7, 1896	
THOMPSON, WILLIAM GEORGE MCNEILL			
59 James St., St. Catharines, Ont., Canada.....		July 2, 1879	

		Date of Membership.
THOMSON, GEORGE HUNTINGTON	Ossining, N. Y.....	Feb. 2, 1887
THOMSON, JOHN	253 Broadway, New York City.....	Mar. 2, 1887
THOMSON, THOMAS KENNARD	Cons. Engr., Park Row Bldg., New York City.....	Oct. 3, 1888 June 3, 1891 Dec. 4, 1895
THURSTON, ROBERT HENRY	Director of Sibley College, and Dean; Prof., Mech. Eng., Cornell Univ., Ithaca, N. Y.....	Dec. 6, 1871
TIBBALS, GEORGE ATTWATER	The Continental Iron Works (Res., 148 Milton St.), Brooklyn, N. Y.....	May 2, 1888 Mar. 4, 1896
TIBBALS, SAMUEL GAYLORD	148 Milton St., Brooklyn, N. Y.....	Jun. M. May 2, 1888 May 5, 1897
TILL, JOSEPH	Freeburg, Houston Co., Minn.....	Oct. 4, 1899
TILLSON, GEORGE WILLIAM	Prin. Asst. Engr., Dept. of Highways, Room 19, Municipal Bldg., Brooklyn, N. Y.....	Oct. 7, 1896
TIMONOFF, VSEVOLOD EVGUENIEVITCH	Prof. of the Institute of Ways of Communications: Director of Ways and Communications of the Division of St. Petersburg, Perspective Zabalkanski 9, St. Petersburg, Russia.....	May 3, 1893
TINGLEY, GEORGE CURTIS	75 Westminster St., Providence, R. I.....	Sept. 6, 1871
TINGLEY, RICHARD HOADLEY	29 Broadway, New York City.....	April 3, 1901
TINKHAM, SAMUEL EVERETT	Asst. Engr., Engineering Dept., City Hall, Boston, Mass.....	Mar. 2, 1892
TINTORER Y GIBERGA, JOSEPH	Claris 46, Barcelona, Spain.....	May 5, 1880
TODD, FRANK HERBERT	Vice-Pres. and Secy., Phoenix Const. Co., 908 Fisher Bldg., Chicago, Ill.....	Feb. 6, 1889
TOMLINSON, ALFRED THOMAS	31 Wabon St., Boston, Mass.....	Sept. 7, 1887
TOMLINSON, SAM	Municipal Engr., Singapore, Straits Settlements.....	April 6, 1892
TOMPKINS, JOHN ANDERSON BAUSH	Asst. U. S. Engr., Room 406, Custom House, Milwaukee, Wis..	Dec. 4, 1889
TOMPSON, GEORGE MORRIS	Parker Rd., Wakefield, Mass.....	May 2, 1888
TONE, SUMNER LA RUE	5607 Howe St., Pittsburg, Pa.....	Dec. 4, 1901
TÖNNESSEN, TOBIAS	2 Granville Pl., Portman Sq., London, W., England.....	May 1, 1901
TOUCEDA, ENRIQUE AUGUSTO	51 State St., Albany, N. Y.....	Jan. 3, 1900

TOWL, FORREST MILTON			
Engr., National Transit Co., 26 Broadway, New York City.....	Feb.	5, 1896	
TOWLE, STEVENSON			
Civ. and Cons. Engr., 220 Broadway, New York City.....	Feb.	19, 1868	
TOWNSEND, CURTIS McDONALD			
Maj., Corps of Engrs., U. S. A., Rock Island, Ill.....	Nov.	1, 1893	
TRASK, FRANK ELLSWORTH			
Cons. Engr., Room 405, Douglas Bldg., Los Angeles, Cal.	{ Assoc. M. M.	June 5, 1895 Jan. 2, 1901	
TREADWELL, LEE			
U. S. Navy Yard, Portsmouth, N. H.....	{ Jun. Assoc. M. M.	Nov. 5, 1890 Oct. 4, 1893 Dec. 2, 1896	
TRIBUS, LOUIS LINCOLN			
Cons. Civ. and Hydr. Engr., 84 Warren St., New York City.....	{ Assoc. M. M.	April 4, 1888 June 1, 1892 April 1, 1896	
TROCON, ALBERT ALEXANDER			
(The Midland Bridge Co., Freygang & Trocon, Proprs.), Kansas City, Mo		May 1, 1895	
TROTTER, ALFRED WILLIAMS			
71 Broadway, New York City.....	{ Jun. M.	Sept. 5, 1883 Nov. 7, 1894	
TRUNDLE, HORATIO HARTLEY			
Cons. Engr., Room 610, Bond Bldg., Washington, D. C.	{ Assoc. M. M.	June 7, 1899 Mar. 6, 1901	
TUBBS, JOSEPH NELSON			
Gen. Insp., State Dept. of Public Works, 207 Wilder Bldg., Rochester, N. Y.....		Sept. 3, 1894	
TUCKER, LESTER WALDO			
Asst. Engr., Boston & Maine R. R., Boston, Mass.....		Dec. 4, 1901	
TULLOCK, ALONZO J			
Prop., Missouri Val. Bridge & Iron Works, Leavenworth, Kans.		June 6, 1883	
TURNER, CLAUDE ALLEN PORTER			
Cons. Engr., 816 Phoenix Bldg., Minneapolis, Minn.....		Mar. 6, 1901	
TURNER, EDMUND KIMBALL			
53 State St., Boston, Mass		Nov. 4, 1891	
TURNER, NATHANIEL			
100 Calle de Matamoras, Monterey, Mexico.....		Mar. 6, 1895	
TUSKA, GUSTAVE ROBITSCHER			
Cons. Engr., 62 William St., New York City.....	{ Jun. Assoc. M. M.	Mar. 6, 1894 Jan. 1, 1896 Nov. 2, 1900	
TUTEIN-NOLTHENIUS, RUDOLPH PETER JOHANN			
Kloppersingel No. 5, Haarlem, The Netherlands.....		Dec. 6, 1899	
TUTHILL, JOB			
Engr. of Bridges, Pere Marquette R. R., Detroit, Mich..	{ Jun. M.	June 6, 1888 Oct. 4, 1893	
TUTTLE, ARTHUR SMITH			
Hydr. Engr., Estate of B. P. Bishop, Box 466, Hon- olulu, Hawaiian Islands.....	{ Jun. Assoc. M. M.	Mar. 2, 1887 May 2, 1894 Mar. 2, 1898	

Date of
Membership.

TUTTON, CHARLES HAROLD		
Asst. Engr., Dept. Public Works, Room 13, City Hall, Buffalo, N. Y.....	Oct. 2, 1901	
TWYMAN, AARON		
Engr., Constr. Dept., The Pullman Co., 6 One Hundred and Twelfth St., Pullman, Ill.....	Mar. 2, 1898	
TYE, WILLIAM FRANCIS		
Chf. Engr. of Constr., Canadian Pacific Ry., Winnipeg, Man., Canada.....	Sept. 1, 1897	
TYSON, ANDERSON HARVEY		
Glenridge, N. J.....	Oct. 2, 1889	
UPHAM, CHARLES CLIFTON		
Vice-Pres. and Gen. Mgr., New York Steam Co., 143 Liberty St., New York City.....	April 7, 1897	
VALUE, BEVERLY REID		
Engr., Third Div., Rapid Transit R. R. Comm., 231 West 125th St., New York City.....	Jan. 2, 1901	
VAN BUREN, JOHN D.		
Newburgh, N. Y.....	May 20, 1868	
VAN BUREN, ROBERT		
58 West Ave., Norwalk, Conn.....	June 17, 1868	
VAN DER HOEK, JACOBUS		
Div. Engr., Lehigh Valley R. R. Co., 25 Ripley Pl., Buffalo, N. Y. April 7, 1897		
VANDERPOOL, EUGENE		
Civ. and Cons. Engr., 757 Broad St., Newark, N. J.....	Sept. 2, 1874	
VANDEVANTER, CHARLES OSCAR		
Engr. in Chg., Western Maryland R. R., Hagerstown, Md.....	Sept. 2, 1896	
VAN HOESSEN, EDMUND FRENCH (<i>Director.</i>)		
Res. Engr., West. Dist., N. Y. C. & H. R. R. Co., Buffalo, N. Y.....	July 1, 1891	
VAN HORNE, JOHN GARRET		
Columbia Bldg., 29 Broadway, New York City.....	Feb. 4, 1880	
VAN ORDEN, CHARLES HOPKINS		
Catskill, N. Y.....	June 1, 1898	
VAN ORNUM, JOHN LANE		
Prof. of Civ. Eng., Washington Univ., St. Louis, { Assoc. M. Mo { M. Oct. 3, 1894 Oct. 4, 1899		
VAN SANT, ROBERT LAWRENCE		
Civ. Engr. and Gen. R. R. Contr., Room 55, Third Nat'l Bank Bldg., St. Louis, Mo.....	Sept. 3, 1884	
VAN WINKLE, EDGAR BEACH		
115 East 70th St., New York City.....	Dec. 2, 1868	
VAUGHAN, GEORGE WASHINGTON		
Div. Engr., Western Div., N. Y. C. & H. R. R. R., 145 Washington St., Buffalo, N. Y.....	Mar. 3, 1886 Nov. 4, 1896	{ Jun. { M.

Date of
Membership.

VAUGHN, GEORGE WASHINGTON				
Engr. in Chg., Joint Track Elevation, A., T. & S. F. Ry. Co., C., M. & N. R. R. Co. and C. & A. Ry. Co., 2476 Archer Ave., Chicago, Ill.....			June 3, 1891	
VIELÉ, MAURICE AUGUSTUS	Jun.	Feb. 4, 1891		
Schenectady, N. Y.....	Assoc. M.	Sept. 7, 1892		
	M.	Oct. 6, 1897		
VON GELDERN, OTTO				
U. S. Asst. Engr., 89 Flood Bldg., San Francisco, Cal.....		May 4, 1892		
VON LEER, ISAAC WAYNE				
813 Crozer Bldg., Philadelphia, Pa.....		May 3, 1899		
VOORHEES, THEODORE				
First Vice-Pres., P. & R. Ry. Co., Reading Terminal, Philadelphia, Pa.....		May 6, 1885		
VORCE, CLARENCE BROWNING	Jun.	April 30, 1895		
Civ. and Cons. Engr., 80 Pearl St., Hartford, Conn.: Chf. Engr., Greenville & Johnsonville Ry.....	Assoc. M.	Oct. 7, 1896		
	M.	May 2, 1900		
WADDELL, JOHN ALEXANDER LOW				
(Waddell & Hedrick, Cons. Engrs.), Kansas City, Mo.....		Oct. 5, 1881		
WADDELL, MONTGOMERY	Jun.	Sept. 1, 1886		
Cons. Engr., 135 Broadway, New York City.....	M.	Sept. 2, 1896		
WADDELL, ROBERT WILLIAM				
City Engr., Kansas City, Mo.....		Sept. 4, 1901		
WADSWORTH, HENRY HAYES				
U. S. Asst. Engr. (Res., 1809 Houghitt Ave.), West Superior, Wis.		Oct. 2, 1901		
WAGNER, SAMUEL TOBIAS				
First Asst. Engr. in Chg. Impvt., Ext. and Filtration, Water Supply, 710 City Hall, Philadelphia, Pa.....		Feb. 2, 1887		
WAINWRIGHT, JONATHAN				
Pres., The Drake & Stratton Co., 32 South Broad St., Philadelphia, Pa.....		Feb. 3, 1892		
WAIT, JOHN CASSAN				
Attorney and Counsellor-at-Law (Eng. and Arch. Jurisprudence), 220 Broadway, New York City.....		Feb. 3, 1892		
WALDO, MARK ALBIGENCE				
226 Third Ave., Leavenworth, Kans.....		May 2, 1900		
WALKER, ELTON DAVID	Jun.	Oct. 4, 1892		
Asst. Prof. of Civ. Eng., The Pennsylvania State College, State College, Pa.....	Assoc. M.	June 1, 1898		
	M.	Sept. 5, 1900		
WALKER, JESSE WAGER				
Room 207, Bissell Blk., Pittsburg, Pa.....		May 7, 1884		
WALKER, JOHN SHAW	Assoc.	May 1, 1894		
Office of Chf. Engt. for Existing Lines, West Australia Govt. Rys., Wellington St., Perth, Western Australia.....	Assoc. M.	Mar. 3, 1897		
	M.	Mar. 6, 1901		
WALKER, JOHN SIMPSON				
U. S. Asst. Engr., Nashville, Tenn.....		Jan. 5, 1881		

Date of
Membership.

R. WALLACE, JOHN FINDLEY (<i>Past-President.</i>)		
Asst. Gen. Mgr., I. C. R. R., 1 Park Row, Chicago, Ill.....	June	2, 1886
WALLACE, JOHN HERBERT		
Engr., M. of W., So. Pac. Co., 4 Montgomery St., San Fran- cisco, Cal.....	Jan.	2, 1890
WALLACE, JOSEPH HARRISON		
Mill Archt. and Industrial Engr., 908 Temple Court Bldg., New York City	Jun. { Assoc. M. M.	Dec. 1, 1896 Dec. 1, 1897 Nov. 6, 1901
WALTON, CHARLES WALLACE		
Engr. and Contr., Natchez, Miss	June	4, 1890
WARD, CHARLES DOD		
702 St. Nicholas Ave., New York City.....	Mar.	3, 1869
WARE, REUEL WILLARD		
810 Second Pl., Plainfield, N. J.....	April	1, 1874
WARNER, EDWIN HALL		
Clark Ave., Republic, Wash.....	May { M. Oct. 4, 1893	6, 1891
WARREN, WILLIAM HENRY		
Challis Prof. of Eng., Univ. of Sydney, Sydney, New South Wales, Australia	Feb.	5, 1890
WASHBURN, FRANK SHERMAN		
Nashville, Tenn.....	Nov.	7, 1888
WATERHOUSE, JOHN		
Cons. Engr., 29 Broadway, New York City.....	Oct.	4, 1899
WATHEN, BENJAMIN SOUTHERN		
Chf. Engr., Texas & Pacific Ry., Dallas, Tex.....	Nov.	2, 1892
WATKINS, FREDERICK WILLIAM		
Div. Engr., Aqueduct Comm. of New York, 43 Old Spring St., White Plains, N. Y.....	Oct.	3, 1883
WATKINS, RICHARD		
8 Mears Ave., Randwick, near Sydney, New South Wales, Aus- tralia	Dec.	3, 1890
WATSON, WILLIAM		
Secy., American Academy of Arts and Sciences, 107 Marlborough St., Boston, Mass.....	Assoc. { M. Sept. 2, 1891	Mar. 1, 1882
WATSON, WILLIAM PARSONS		
Chf. Engr., Columbia Valley R. R., 501 Weidler St., Portland, Ore.....	June	1, 1887
WATT, DAVID ALEXANDER		
U. S. Asst. Engr., Louisa, Ky.....	Feb.	6, 1901
WAY, JAMES WILLIAM		
Chf. Engr., The M. P. Ry. Co., St. L., I. M. & S. Ry. Co., and Leased, Operated and Independent Lines, St. Louis, Mo....	Dec.	2, 1891
WAY, ROBERT ATTWELL		
Agt. (Vice-Pres.) and Chf. Engr., Assam Bengal Ry., Chitta- gong, India.....	June	7, 1893
WEBB, GEORGE HERBERT		
1105 North St., Little Rock, Ark.....	Feb.	1, 1893
WEBER, ALEXANDER HAMILTON		
Asst. Engr., Dept. of Cuba, Havana, Cuba.....	Oct.	3, 1900

WEBSTER, CHARLES EDWARD			
Div. Engr., N. Y. C. & H. R. R. R., Clearfield, Pa.....		Oct. 4, 1899	
WEBSTER, GEORGE SMEDLEY			
Chf. Engr. and Surv., Bureau of Surveys, City	{ Assoc. M.	Sept. 7, 1892	
Hall, Philadelphia, Pa.....	{ M.	Oct. 4, 1893	
WEBSTER, WILLIAM RICHARDSON			
Cons. and Insp. Engr., 411 Walnut St., Philadelphia, Pa.....		April 5, 1899	
WEGMANN, EDWARD			
Div. Engr., Aqueduct Comm., Katonah, N. Y.....		Mar. 7, 1888	
WEINHAGEN, FRED			
706 Pabst Bldg., Milwaukee, Wis.....		July 4, 1888	
WEISKOPF, SAMUEL C.			
Chf. Engr., Thompson-Starrett Co., Building Con-	{ Jnn. May 7, 1884		
struction, 51 Wall St., New York City.....	{ M. Dec. 5, 1888		
WELLMAN, SAMUEL THOMAS			
Pres., Wellman Seaver Engineering Co., New England Bldg..			
Cleveland, Ohio.....		Oct. 5, 1898	
WELLS, CHARLES EDWIN			
Div. Engr., Met. Water and Sewerage Board, 55 Prescott St.,			
Clinton, Mass.....		June 1, 1892	
WELLS, JAMES HOLLIS			
32 Nassau St., New York City.....		Feb. 5, 1901	
WENTWORTH, CHARLES CHANCELLOR			
Care, Norfolk & Western Ry., Roanoke, Va.....		April 4, 1888	
WENTWORTH, WILLIAM HENRY			
Pres., Las Norias Mining Co., Monterey, Nuevo Leon, Mexico.		Jan. 2, 1889	
WESTINGHOUSE, GEORGE, Jr.			
Pittsburg, Pa.....		Jan. 7, 1891	
WESTON, CHARLES VALENTINE			
Cons. and Contr. Engr., 711 Merchants' Loan and Trust Bldg.,			
Chicago, Ill.....		Sept. 5, 1900	
WESTON, EDMUND BROWNE			
Cons. Engr., 86 Weybosset St., Providence, R. I.		Dec. 6, 1882	
WETHERBEE, GEORGE ALBERT			
City Engr., City Hall, Malden, Mass.....		April 5, 1893	
WETHERILL, WILLIAM CHATTIN			
Cons. Engr., New Jersey Zinc Co., Canon City, Colo.....		Dec. 1, 1886	
WHEELER, DANIEL MERRICK			
State Railroad Insp., 315 Salisbury St., Worcester, Mass.....		Mar. 6, 1901	
WHEELER, EBENEZER SMITH			
U. S. Asst. Engr., Detroit, Mich.....		Nov. 7, 1883	
WHEELER, GEORGE MONTAGUE			
930 Sixteenth St., N. W., Washington, D. C.....		Mar. 7, 1894	
WHEELER, LEVI LOCKWOOD			
Asst. U. S. Engr., Illinois and Mississippi Canal, Sterling, Ill..		June 4, 1884	
WHEELER, SCHUYLER SKAATS	{ Jun.	Mar. 2, 1887	
Pres., Crocker-Wheeler Co., Ampere, N. J.....	{ M.	Feb. 6, 1889	
WHEELER, WILLIAM			
Cons. Civ. Engr., 14 Beacon St., Boston, Mass.....		Oct. 4, 1893	

		Date of Membership.
WHINERY, SAMUEL	{ Jun.	April 1, 1874
Cons. Engr., 95 Liberty St., New York City.....	{ M.	May 4, 1881
WHISTLER, THOMAS DELANO	{ Jun.	Mar. 5, 1884
2 West Biddle St., Baltimore, Md.....	{ M.	May 2, 1888
WHITCOMB, HENRY DONALD		
Richmond, Va.....		Feb. 21, 1872
WHITE, GEORGE HOWARD		
Worcester Sewer Dept.; Address, 20 Shattuck St., Worcester, Mass.		May 2, 1883
WHITE, HENRY FISHER		
Chf. Engr., B. C. R. & N. Ry., Cedar Rapids, Iowa.....		Jan. 2, 1890
WHITE, TIMOTHY SIDNEY		
Vice-Pres. and Chf. Engr., Penn Bridge Co., Beaver Falls, Pa..		April 3, 1889
WHITFORD, OSCAR F.		
79 Woodlawn Ave., Buffalo, N. Y.....		Dec. 6, 1871
WHITFORD, REID		
U. S. Asst. Engr., U. S. Engr. Office, Georgetown, S. C.....		Dec. 2, 1896
WHITNEY, FRANK ORMOND		
Chf. of Surv. Div. of the Eng. and Street Laying-Out Depts., 25 Old Court House, Boston, Mass.....	{ Jun. M.	May 3, 1876 Jan. 5, 1887
WHITTEMORE, DON JUAN (<i>Past-President.</i>)		
Chf. Engr., Chicago, Milwaukee & St. Paul Ry. Co., 1100 Old Colony Bldg., Chicago, Ill. (Res., 222 Biddle St., Milwaukee, Wis.)		July 10, 1872
WHITTEN, NATHAN HOLLIS		
Engr., Holyoke Machine Co., Holyoke, Mass.....		June 7, 1876
WILEY, ANDREW JACKSON		
Chf. Engr., Trade Dollar Consolidated Mining Co.'s Swan Falls Power Plant, Boise, Idaho.....		Dec. 5, 1894
WILEY, WILLIAM HALSTED		
43 East 19th St., New York City.....		Feb. 17, 1869
WILGUS, WILLIAM JOHN (<i>Director.</i>)		
Chf. Engr., N. Y. C. & H. R. R. R., Grand Central Station, New York City		April 1, 1896
WILKINS, WILLIAM GLYDE		
Westinghouse Bldg., Pittsburg, Pa.....		Dec. 4, 1889
WILLARD, JAMES EAGER		
406 Columbia Bldg., Louisville, Ky.....		May 1, 1889
WILLIAMS, CYRUS JOHN RICHARD		
Water Supply Dept., Brisbane, Queensland, Australia.....		Feb. 6, 1901
WILLIAMS, DAVID		
Asst. Engr., Boston & Maine R. R., St. Johnsbury, Vt.....		May 4, 1898
WILLIAMS, EDWARD GILBERT		
Engr. and Supt., The Caribbean Manganese Co., Colon, Repub- lic of Colombia.....		Feb. 3, 1897
WILLIAMS, GARDNER STEWART		
Engr. in Chg. of the Hydr. Laboratory, and Prof. of Experimental Hydraulics, Cornell Univ., 4 Valentine Pl., Ithaca, N. Y.....	{ Assoc. M. M.	Oct. 2, 1895 Dec. 6, 1899

WILLIAMSON, FRANCIS STUART			
Cons. Engr., 25 Broad St., New York City.....		Sept. 7, 1887	
WILLIAMSON, SYDNEY BACON	{ Assoc. M.	Jan. 3, 1894	
U. S. Asst. Engr., Newport, R. I.....	} M.	Dec. 2, 1896	
WILLIS, PAUL			
Secy. and Engr., Kenwood Bridge Co., 4740 Lake Ave., Chicago, Ill.....		Oct. 2, 1901	
WILSON, CHARLES ALFRED			
Chf. Engr., C., H. & D. Ry. Co., Cincinnati, Ohio.....		April 1, 1891	
WILSON, ELLIOTT H.			
Civ. and Min. Engr. (Receiver of the Minnie Healey Mine), Butte, Mont.....		Feb. 1, 1888	
WILSON, GEORGE LEVERETT			
Asst. City Engr., St. Paul, Minn.....		Feb. 5, 1890	
WILSON, HENRY WILLIAM			
Drexel Bldg., Philadelphia, Pa.....		Sept. 6, 1876	
WILSON, HERBERT MICHAEL	{ Jun.	Sept. 5, 1883	
Geographer, U. S. Geological Survey, Washington, D. C., M.		Jan. 15, 1890	
WILSON, JOSEPH MILLER			
Civ. Engr. and Archt., 1030 Drexel Bldg., Philadelphia, Pa.....		April 2, 1873	
WILSON, WINTER LINCOLN			
Asst. Prof. in Chg. Dept. Civ. Eng., Tulane Univ. of La., New Orleans, La.....		May 1, 1901	
WIMMER, SEBASTIAN			
Assoc. Engr., Pittsburgh, Carnegie & Western R. R.; Office, 331 Fourth Ave., Pittsburgh, Pa.....		Mar. 2, 1881	
WINGFIELD, NISBET			
Commr. of Public Works, Augusta, Ga.....		May 1, 1895	
WISNER, GEORGE Y.			
Cons. Engr., 39 West Canfield Ave., Detroit, Mich.....		April 5, 1876	
WÖLFEL, PAUL LUDWIG	{ Jun.	July 3, 1889	
Chf. Engr., American Bridge Co., Pencoyd, Pa.....	{ Assoc. M.	July 1, 1891	
	{ M.	Nov. 6, 1895	
WOOD, HENRY BEECHER			
Asst. Engr., Harbor and Land Comm., Room 134, State House, Boston, Mass.....		April 3, 1895	
WOOD, JOSEPH			
Vice-Pres., Pennsylvania Lines West of Pittsburg, Pittsburg, Pa.		April 1, 1874	
WOODBURY, CHARLES JEPHTA HILL			
Asst. Engr., American Bell Telephone Co., 125 Milk St., Boston, Mass.....		Dec. 3, 1884	
WOODRUFF, EDWARD LOWREY			
Asst. Engr., Ninth Light House Dist., Milwaukee, Wis.....		Oct. 3, 1900	
WOODS, HENRY DICKINSON	{ Assoc. M.	Mar. 1, 1893	
99 Highland St., West Newton, Mass.....	} M.	June 5, 1895	
WORCESTER, JOSEPH RUGGLES			
Cons. Engr., 53 State St., Boston, Mass.....		Jan. 2, 1895	
WORTHINGTON, CHARLES	{ Assoc. M.	Dec. 1, 1897	
Cons. Engr., 331 Fourth Ave., Pittsburg, Pa.....	} M.	Nov. 6, 1901	

		Date of Membership.
WRIGHT, AUGUSTINE WASHINGTON	Pomona, Cal.....	May 5, 1886
WRIGHT, CHARLES HERBERT	Chf. Engr., Brown Hoisting Machinery Co., Cleveland, Ohio....	Oct. 5, 1892
WRIGHT, EDWARD THOMAS	226 South Spring St., Los Angeles, Cal.....	Feb. 3, 1886
WRIGHT, WILLIS BENTON	Asst. Engr., Drainage Comm., Room 20, City Hall, New Orleans, La.....	Nov. 3, 1897
WROTNOWSKI, ARTHUR FRANCIS	Hermosillo, Sonora, Mexico.....	July 12, 1877
YATES, PRESTON KING	Snpt. for the L. P. & J. A. Smith Co., Contrs., Cleve- land, Ohio.....	Jun. 6, 1883 M. April 5, 1893
YEATMAN, CHARLES POPE	Mgr., Barranquilla R. R. & Pier Co., Barranquilla, Colombia...	Feb. 2, 1887
YEATMAN, MORGAN EDWARD	Care, S. Pearson & Son, Ltd., 10 Victoria St., London, S. W., England.....	May 4, 1892
YEATMAN, POPE	12 Chestnut Ave., Chestnut Hill, Philadelphia, Pa.....	Oct. 4, 1893
YONGE, SAMUEL HUMPHREYS	U. S. Asst. Engr. in Chg. of Impvt. James River, Va., and Protection of Jamestown Island, 905½ East Main St., Richmond, Va.....	May 5, 1880
C. YORK, HERBERT WALDO	Chf. Engr., United Electric Light & Power Co., 55 Duane St., New York City.....	Jun. 2, 1888 M. June 3, 1896
YOUNG, JOHN	Geneseo, N. Y.....	Mar. 7, 1888
ZIESING, AUGUST	Western Mgr., American Bridge Co., 1316 Monadnock Blk., Chicago, Ill.....	Oct. 5, 1898
ZIFFER, EMANUEL A	Pres., Council of Adm. Imp. Royal Priv., Lemberg-Czernowitz & Jassy Ry., Opernring 5, Vienna, Austria.....	June 7, 1893
ZOLLINGER, LUTHER REESE	Superv., Pennsylvania R. R., Philadelphia Terminal Div., 32d St. and Powelton Ave., Philadelphia, Pa.....	Mar. 6, 1901
ZOOK, MORRIS ALEXANDER	P. O. Box 468, Louisville, Ky.....	Oct. 4, 1899

ASSOCIATE MEMBERS.

[Assoc. M. Am. Soc. C. E.]

		Date of Membership.
ABELLA, JUAN	Cons. Engr., Buenos Aires & Belgrano Electric Tramways Co., 691 Calle Bolivar, Buenos Aires, Argentine Republic.....	Jan. 6, 1897
ADAMS, EDWIN GRIGGS, Jr.	Director, School of Civ. Eng., Imperial University, Tientsin, China.....	Jun. 1, 1896
ADAMS, JULIUS LEROY	Chf. Engr., Hartford, Manchester & Rockville Tram- way Co., South Manchester, Conn.....	{ Jun. Jan. 4, 1888 Assoc. M. April 5, 1899
AFFELDER, LOUIS JACOB	Contr. Engr., American Bridge Co. of New York, Pittsburg, Pa. (Res., 1211 Sheffield St., Alle- gheny, Pa.).....	{ Jun. Feb. 4, 1896 Assoc. M. June 5, 1901
ALBERTSON, CHARLES	Mgr., Eng. Dept., Flint, Eddy & American Trading Co., 99 Kitamachi, Kobe, Japan.....	{ Jun. Oct. 1, 1895 Assoc. M. Mar. 1, 1899
ALDEN, CHARLES AMES	Chf. Draftsman, F. S. & S. Dept., The Pennsylvania Steel Co., Steelton, Pa.....	May 4, 1898
ALDEN, HERBERT CLARENDON	Asst. Engr., Aqueduct Comm., Jerome Park Reservoir, Kings- bridge, New York City.....	Mar. 1, 1893
ALDERMAN, CHARLES ALDO	Interurban Union Station, Columbus, Ohio.....	April 6, 1898
ALLAN, ALEXANDER GEORGE	426 Elmwood Ave., Topeka, Kans.....	Mar. 6, 1901
ALLAN, PERCY	Engr. in Chg. of Bridge Design, Public Works Dept., Sydney, New South Wales, Australia.....	April 1, 1896
ALLEN, FRANK WILLIAM	865 Eighth Ave., New York City.....	{ Jun. Nov. 3, 1896 Assoc. M. May 4, 1898
ALLEN, HENRY CLAYTON	Res. Engr., New York State Canals, Syracuse, N. Y	July 1, 1891
ALLEN, WILLIAM ANDREW	Supt. of Constr., Perth Amboy Plant, American Smelting & Re- fining Co., Maurer, N. J.....	Feb. 6, 1901
ALLEN, WILLIAM FREDERICK	Secy. and Treas., American Railway Association; Editor and Mgr., Official Railway Guide, 24 Park Pl., New York City....	Jan. 3, 1900

Date of
Membership.

AMES, GEORGE MARSHALL			
Civ. Engr. and Contr., Office, 121 Ottawa St., Grand Rapids, Mich.....		June 7, 1899	
ANDERSON, DAVID GUY			
U. S. Asst. Engr., Engr. Office, U. S. A., Mobile, Ala.....	Oct.	4, 1899	
ANDROS, FREDERIC WILLIAM			
Chf. Engr., Chihuahua & Pacific R. R., Apartado 46, Chihuahua, Mexico.....	Feb.	1, 1899	
ANGIER, WALTER EUGENE			
Res. Engr., S. I. & M. Br. Co., Thebes, Ill.....	Sept.	7, 1892	
ARANGO, RICARDO MANUEL			
Panama, Colombia.....	Sept.	2, 1896	
ARCHER, STEVENSON, JR.			
Asst. Engr., Mo. Pac. R. R., Greenville, Miss.....	Nov.	3, 1897	
AVERILL, FRANK LLOYD			
Structural Engr., Office of Superv. Archt., U. S. Treas. Dept., (Res., 1479 Columbia Rd.), Washington, D. C.....	Jan.	6, 1897	
AYLETT, PHILIP			
Bridge Engr., S. A. L. Ry., Portsmouth, Va.....	June	3, 1896	
AYRES, CLARENCE MORTON			
U. S. Jun. Engr., Insp. in Chg. of Construction, Lock and Dam No. 4, Black Warrior River, Tidewater, Ala.....	Oct.	2, 1901	
BABB, CYRUS CATES			
Hydrographer, U. S. Geological Survey, Washington, D. C.....	{ Jun. Assoc. M.	Feb. 2, 1892 Feb. 3, 1897	
BAILEY, WILLIAM MELVIN			
Engr. for Eastern Expanded Metal Co., Pemberton Bldg., Boston, Mass. (Res., 15 Mt. Vernon St., Malden, Mass.).....	Sept.	5, 1900	
BAIRD, HOWARD CARTER	{ Jun. Assoc. M.	June 6, 1893	
Asst. Engr., Phoenix Iron Co., Phoenixville, Pa....	{ Assoc. M.	Oct. 5, 1898	
BAIRD, SAMUEL POND			
Supt., Portsmouth St. R. R. Light Co., Portsmouth, Ohio.....	Mar.	1, 1899	
BAKER, ELISHA BROWN			
Morgantown, W. Va.....	April	1, 1896	
BALDWIN, ERNEST HOWARD			
Asst. Engr., M. W. W., Boylston, Mass.....	May	4, 1898	
BALDWIN, HIRAM ELLSWORTH			
47 Hough Pl., Cleveland, Ohio	Jan.	2, 1895	
BARBER, WILLIAM DAVIS			
Asst. Engr. in Chg. of Div. of Pumping Station Construction and Repairs, Dept. of Public Works, 325 City Hall, Chicago, Ill..	Sept.	1, 1897	
BARNES, MORTIMER GRANT			
U. S. Insp. on Constr. Work, Illinois and Mississippi Canal, Sterling, Ill.....	Nov.	2, 1898	
BARNES, WILLIAM THOMAS			
773 Broadway, South Boston, Mass.....	Sept.	7, 1898	
BARNETT, ROBERT CRARY			
Care, Vera Cruz & Pacific Ry., Orizaba, Mexico.....	Dec.	5, 1900	

ASSOCIATE MEMBERS.

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Date of
Membership.

BARNEY, PERCY CANFIELD			
Draftsman in Chg., Dept. of Yards and Docks, Navy Yard, Boston, Mass.	{ Jun. Assoc. M.	Mar. 3, 1896 June 5, 1901	
BARNEY, SAMUEL EBEN			
Asst. Prof. of Civ. Eng., Sheffield Scientific School, Yale Univ., 346 Whitney Ave., New Haven, Conn.	{ Jun. Assoc. M.	June 2, 1886 Feb. 3, 1892	
BARNESLEY, GEORGE THOMAS			
Asst. Engr. in Chg. of Constr., Monongahela River Bridge, 64 Water St., Pittsburgh, Pa.	{ Jun. Assoc. M.	May 31, 1892 Mar. 7, 1894	
BARR, JOSEPH CARROLL			
(Burt & Porter, Contr. Engrs.), Bank for Savings Bldg., Pittsburgh, Pa.		Jan. 4, 1899	
BASCOM, HARRY FRANKLIN	{ Jun.	Dec. 5, 1899	
(Lehr & Bascom), 720 Hamilton St., Allentown, Pa.	{ Assoc. M.	Sept. 4, 1901	
BASCOME, WESTERN RADFORD	{ Jun.	Dec. 3, 1891	
Asst. Engr., New East River Bridge, 84 Broadway, Brooklyn, N. Y.	{ Assoc. M.	May 5, 1897	
BASINGER, JAMES GARNETT			
Asst. Engr., Dept. of Docks and Ferries (Res., 243 West 131st St.), New York City		Oct. 3, 1900	
BAUER, JACOB LOUIS		Feb. 5, 1896	
68 Bible House, New York City			
BAUM, GEORGE	{ Jun.	June 4, 1892	
Asst. Engr. in Chg. of Constr., Consolidated Gas Co. of N. Y., 111th St. and First Ave., New York City	{ Assoc. M.	Apr. 5, 1899	
BAUSHER, CARMY IRVING			
Asst. Engr., B. & C. Dept., The Pennsylvania Steel Co., Steelton, Pa., 136 North 13th St., Harrisburg, Pa.		Dec. 7, 1898	
BELL, ALFRED CARROLL	{ Jun.	May 2, 1893	
Contr. Engr., Wisconsin Bridge & Iron Co., 515 Guaranty Loan Bldg., Minneapolis, Minn.	{ Assoc. M.	Jan. 2, 1901	
BELL, GEORGE JOSEPH			
County Surv. and Bridge Master for Cumberland, The Courts and 16 Portland Sq., Carlisle, England		Nov. 1, 1898	
BELLOWS, OSCAR FRANCIS			
Supt. of Constr., Q. M. Dept., U. S. A., at Fort Morgan and Fort Gaines, Ala.; Address, Fort Morgan, Ala.		Dec. 4, 1901	
BENTZON, ADRIAN BENONI			
Engr. to Peruvian Corporation, Ltd., Lima, Peru		Mar. 6, 1901	
BERGENGREN, FRITZ CARL ANDERS GEORG			
Cons. Engr., 14 South Market Sq., Harrisburg, Pa.		Dec. 2, 1896	
BERGER, BERNT			
Asst. to Theodore Cooper, 35 Broadway, New York City		April 5, 1893	
BERLE, KORT			
First Asst. Engr., Superv. Archt.'s Office, Treas. Dept., Washington, D. C.		Dec. 6, 1899	
BETTES, CHARLES ROBERT	{ Jun.	Oct. 1, 1890	
Chf. Engr., Queens County Water Co., Far Rockaway, N. Y.	{ Assoc. M.	June 7, 1893	

Date of
Membership.

BETTS, EDWARD EVERETT			
Engr. in Chg., Chickamauga and Chattanooga National Military Park, Vicksburg National Military Park, Chattanooga, Tenn.		April 5, 1899	
BETTS, ROMEO THOMPSON			
Asst. Engr., Dept. of Docks and Ferries, Foot of East 39th St., New York City.....	Oct. 3, 1900		
BEUGLER, EDWIN JAMES	{ Jun.	June 19, 1891	
Asst. Engr., N. Y., N. H. & H. R. R., Boston, Mass.	{ Assoc. M.	Feb. 1, 1899	
BISHOP, WILLIAM ISRAEL			
Care, Pittsburg Reduction Co., Pittsburg, Pa.....	Feb. 6, 1901		
BLODGETT, JOHN	{ Jun.	Dec. 4, 1889	
Care, American Bridge Co., 51st St., Pittsburg, Pa..	{ Assoc. M.	Jan. 2, 1901	
BOATRITE, JAMES EDWIN	{ Jun.	Feb. 5, 1895	
190 Convent Ave., New York City.....	{ Assoc. M.	Nov. 3, 1897	
BOECKLIN, WERNER, Jr.	{ Jun.	Mar. 1, 1892	
Asst. Engr., Heyl & Patterson, Pittsburg, Pa.....	{ Assoc. M.	Dec. 1, 1897	
BOGGS, JOHN INNERARITY			
Old Orchard, St. Louis Co., Mo.....	April 3, 1895		
BOLLER, ALFRED PANCOAST, Jr.			
Eng. Dept., H. R. Worthington Hydraulic Works, Brooklyn, N. Y.....	{ Jun. Assoc. M.	Oct. 2, 1894 May 3, 1899	
BONNETT, CHARLES PIERRE	{ Jun.	June 2, 1886	
421 Westminster Ave., Elizabeth, N. J.....	{ Assoc. M.	Mar. 6, 1901	
BORIGHT, WILLIAM PARSONS	{ Jun.	Jan. 2, 1894	
3521 N. Warnock St., Philadelphia, Pa.....	{ Assoc. M.	Mar. 1, 1899	
BOURNE, THOMAS JOHNSTONE			
(S. Pearson & Sons, Ltd.), 10 Victoria St., Westminster, London, S. W., England.....	Feb. 7, 1900		
BOWEN, EDMUND IGNATIUS			
Roadmaster, Allegheny Div., Erie R. R. Co., Hornellsville, N. Y.	Nov. 1, 1899		
BOYD, JAMES CHURCHILL			
Roadmaster, Elev. Lines, Boston Elev. Ry. Co., Sullivan Sq. Terminal Sta., Charlestown, Mass...	{ Jun. Assoc. M.	Sept. 3, 1895 May 1, 1901	
BRACE, JAMES HENRY			
Chf. Asst. Engr., Michigan Lake Superior Power Co., Sault Ste. Marie, Mich.....	Jan. 2, 1901		
BRANCH, THOMAS PETTUS, Jr.			
Jun. Prof., Georgia School of Technology, Atlanta, Ga	Feb. 5, 1902		
BRANNE, JOHN SEVERIN			
Structural Eng. Dept., American Bridge Co., 7 West 22d St., New York City (Res., 266 First Ave., Mt. Vernon, N. Y.)....	Oct. 5, 1898		
BRAUNE, GUSTAVE MAURICE	{ Jun.	June 2, 1896	
Engr., Southern Bridge Co., Birmingham, Ala.....	{ Assoc. M.	Sept. 4, 1901	
BRAXTON, JAQUELIN MARSHALL	{ Jun.	Jan. 5, 1897	
Supt., U. S. Engr. Dept., Key West, Fla.....	{ Assoc. M.	May 3, 1899	
BRERETON, THOMAS JOHN	{ Jun.	Oct. 7, 1885	
Engr., Cumberland Valley R. R., Chambersburg, Pa.	{ Assoc. M.	June 5, 1895	

BROOK-FOX, EVELYN			
Asst. Engr., East Indian Ry., Care, Grindlay & Co., Calcutta, India.....	Feb. 2, 1898		
BROOKS, JOHN PASCAL			
Prof. of Civ. Eng., State College of Kentucky, P. O. Box 295, Lexington, Ky.	April 1, 1896		
BROWN, ROBERT KING, JR.			
Asst. Supt., Pittsburg Plate Glass Co., Crystal City, Mo.	June 7, 1893		
BROWN, WENDELL PHILLIPS			
Engr., The King Bridge Co., Cleveland, Ohio.	Oct. 2, 1895		
BROWNE, JAMES SIMPSON			
Asst. Engr., N. Y., N. H. & H. R. R., 467 South Terminal Sta- tion, Boston, Mass.	Oct. 4, 1893		
BROWNELL, ERNEST HENRY			
Brownell Bldg., 107 Westminster St., Providence, R. I.	Jan. 1, 1896		
BRYAN, KENNERLEY	{ Jun.	Mar. 5, 1890	
Otis Elevator Co., Mills Bldg., San Francisco, Cal. { Assoc. M.	Jan. 4, 1893		
BRYDONE-JACK, ERNEST EDMUND			
Prof. in Chg., Eng. Dept., and Bursar, Univ. of New Brunswick, Fredericton, N. B., Canada.	Oct. 4, 1899		
BRYSON, THOMAS BINES			
52 West 21st St., New York City.	Feb. 7, 1900		
BURCHARD, ANSON WOOD			
368 Main St., Danbury, Conn.	May 3, 1893		
BURDEN, JAMES			
3 Locust Ave., Troy, N. Y.	Feb. 5, 1902		
BURDEN, MORTON			
Care, Eng. Dept., American Bridge Co., Pittsburg, Pa.	{ Jun. Feb. 4, 1896 { Assoc. M. Jan. 2, 1901		
BURDETT, FREDERICK ANDERSON	{ Jun.	Feb. 2, 1897	
Civ. and Cons. Engr., 7 East 33d St., New York City. { Assoc. M.	June 1, 1898		
BURNS, CLINTON SUMNER			
(Burns & McDonnell, Civ., Hydr. and San. Engrs.), Postal Tele- graph Bldg., Kansas City, Mo.	Feb. 1, 1899		
BURNS, JAMES FERGUSON			
Asst. Engr., Louisville & Nashville R. R. Co., Hop- kinsville, Ky.	{ Jun. Oct. 1, 1895 { Assoc. M. Sept. 6, 1899		
BURNS, JUSTIN			
Rapid Transit R. R. Comm., 13 Astor Pl., New York City.	April 6, 1898		
BUSH, EDWARD WALLACE			
Asst. Engr., Conn. River Bridge and Highway Dist. Comm., Ætna Life Bldg., Hartford, Conn.	April 5, 1899		
BUTTS, EDWARD PONTANY			
Chf. Engr., American Writing Paper Co., Holyoke, Mass. (Res., Springfield, Mass.).	Feb. 2, 1898		
CAMPBELL, ALBERT JOHNSTONE			
Broad St. Ave., London, E. C., England.	May 2, 1894		

		Date of Membership.
CARLILE, THOMAS JENKS		
Asst. Engr., Bureau of Surveys, 4215 Chestnut St., Philadelphia, Pa.	{ Jun. Assoc. M.	Mar. 3, 1896 Mar. 6, 1901
CARR, ALBERT		
Engr., First Div., Rapid Transit Comm., 13 Astor Pl., New York City (Res., 19 Amherst St., East Orange, N. J.)		Mar. 2, 1892
CARTER, SHIRLEY	{ Jun. Assoc. M.	May 31, 1892 Oct. 5, 1898
Richmond, Va.		
CARTER, WILLIAM J	{ Jun. Assoc. M.	Feb. 5, 1895 Sept. 7, 1898
City Engr., 2042 Woodland Hills Ave., Cleveland, Ohio		
CHAMBERS, FRANK TAYLOR		
Civ. Engr., U. S. N., League Island Navy Yard, Philadelphia, Pa.		April 6, 1898
CHAMBERS, RALPH HAMILTON		
(Chambers & Hone, Civ. Engrs.), 60 New St., New York City	...	Dec. 1, 1898
CHAPLEAU, SAMUEL JEFFERSON		
Asst. Engr., Dept. Public Works, P. O. Box 347, Ottawa, Ont., Canada		May 1, 1901
CHARLSWORTH, WILLIAM SAXON		
Engr., Opotiki County Council, Opotiki, Auckland, New Zealand		Nov. 1, 1899
CHASE, RICHARD DAVENPORT		
With Allen Hazen, Cons. Engr., St. Paul Bldg., New York City	{ Jun. Assoc. M.	Oct. 5, 1897 Oct. 3, 1906
CHESTER, CHARLIE ELLSWORTH		
Shelbyville, Ill.		May 4, 1898
CHILD'S, OLIVER W.		
Chf. Engr., Stupp Bros. Bridge & Iron Co., 2301 South 7th St., St. Louis, Mo.		Sept. 5, 1900
CHRISTIAN, GEORGE LYON		
Asst. Engr., Dept. of Sewers, Bronx Borough, 177th St. and Third Ave. (Res., East 238th St., Woodlawn), New York City		Mar. 6, 1895
CHRISTY, GEORGE LEWIS	{ Jun. Assoc. M.	June 5, 1893 Nov. 4, 1896
128 West 42d St., New York City		
CLAPP, GEORGE HUBBARD		
Chairman, Pittsburg Testing Laboratory, Ltd., 325 Water St., Pittsburgh, Pa.		July 1, 1891
CLARK, EDWIN		
Structural Engr. and Bldg. Insp., Room 317, City Hall, Bureau of Bldg. Inspection, Philadelphia, Pa.		Jan. 6, 1897
CLARK, GEORGE HALLETT		
Senior Asst. Engr., Rapid Transit Comm., 13 Astor Pl., New York City	{ Jun. Assoc. M.	Oct. 3, 1893 April 6, 1898
CLEVERDON, HENRY LAWRENCE		
Chf. Engr., Lansing, St. Johns & St. Louis Ry., Lansing, Mich.		Mar. 1, 1899
COATES, FRANK RAYMOND		
Chf. Engr., Chicago Great Western Ry., St. Paul, Minn.	....	Jan. 3, 1900

COHEN, FREDERICK WILLIAM			
Engr. of Erection, Bridge and Constr. Dept., The Pennsylvania Steel Co., Steelton, Pa.....	Feb.	3, 1897	
COLE, BURT			
Engr., Consolidated Coal Co., 164 Laclede Bldg., St. Louis, Mo.	Jan.	2, 1901	
COLEMAN, FREDERICK ALBERT			
Supt., Valley Coal & Coke Co.; Gen. Supt., Belington & Northern R. R. Co., Belington, W. Va ...	Jun.	April 4, 1893	
Assoc. M.	April 5, 1899		
COLEMAN, HENRY FITCH			
P. O. Box 261, Jenkintown, Pa.....	Mar.	6, 1895	
COLLIER, BRYAN CHEVES			
Asst. Engr., Dept. of Highways (Res., 114 West 137th St.), New York City.....	Oct.	3, 1900	
COMSTOCK, CHARLES WORTHINGTON			
Prof. of Min. Eng., Colorado School of Mines, Golden, Colo.; Address, 278 South Lincoln Ave., Denver, Colo.....	Jun.	April 5, 1892	
Assoc. M.	Feb. 7, 1900		
CONKLING, LEON DE VELE			
Asst. City Engr., Elmira, N. Y.....	Dec.	4, 1901	
CONSTANT, FRANK HENRY			
Prof. of Structural Eng., Univ. of Minnesota, Minneapolis, Minn.	Dec.	2, 1896	
CONVERSE, WILLIAM HASSON			
Pres., Converse Bridge Co., Chattanooga, Tenn.....	Jan.	6, 1892	
COOK, JOHN HENRY			
Hydr. Engr., Society for Establishing Useful Manufactures, Washington St., Paterson, N. J.....	May	4, 1898	
COOLEY, MAURICE WURTZ			
Mgr., The National Contracting Co., 70 Kilby St., Boston, Mass.	Mar.	7, 1894	
COOMBS, ROBERT DUNCAN, Jr.			
Asst. Engr., Bridge and Constr. Dept., Pennsylvania Steel Co., Steelton, Pa.; Address, P. O. Box 290, Harrisburg, Pa.....	Jun.	May 2, 1899	
Assoc. M.	Feb. 7, 1900		
CORBY, CHARLES EDWARD			
In Chg. of Drafting Room, Met. Street Ry. Co., 822 Putnam Ave., Brooklyn, N. Y.....	Oct.	4, 1893	
CORNELL, DOUGLAS			
Structural Engr., Bureau of Bldg., 1 Municipal Bldg., Buffalo, N. Y.....	Sept.	6, 1899	
CORNER, CHARLES			
Dist. Engr., Rhodesia Rys., Salisbury, Mashonaland, South Africa	May	1, 1895	
CORTI, JOSEPH JAMES			
Casilla Correa 68, Mendoza, Argentine Republic.....	Jan.	1, 1896	
CORY, HARRY THOMAS			
Prof. of Civ. Eng., and Dean, College of Eng., Univ. of Cincinnati, Cincinnati, Ohio.....	Jun.	June 20, 1893	
Assoc. M.	Mar. 7, 1900		
COSMUS, JOHN ALBERT			
Special Agt., Continental Fire Ins. Co., P. O. Box 124, Albany, N. Y.....	June	3, 1896	

		Date of Membership.
COVERDALE, WILLIAM HUGH		
Asst. Engr., J. G. White & Co., 29 Broadway, New York City.....	Jun. Assoc. M.	Jan. 2, 1894 Oct. 3, 1900
COWPER, JOHN WHITFIELD		
Engr. and Supt., British Westinghouse Electric & Mfg. Co., Ltd., Mersey Tunnel Ry. Impvts., Birkenhead, England.....	Jun. Assoc. M.	June 21, 1894 Oct. 2, 1901
COX, LEONARD MARTIN		
Civ. Engr., U. S. N., Naval Station, Guam, Ladrone Islands..		Oct. 4, 1899
CRABBS, CLARENCE LINCOLN		
1619 Sixth Ave., Moline, Ill.....		May 1, 1895
CREHORE, WILLIAM WILLIAMS		
39 Cortlandt St., New York City.....		April 4, 1894
CUDDEBACK, ALLAN WINTER		
Asst. Engr., Passaic Water Co., Paterson, N. J.....		April 5, 1899
CUDWORTH, FRANK GRANT		
Asst. Engr., Manhattan Ry. Co., 195 Broadway, New York City (Res., Stewart and Bay Ridge Aves., Brooklyn, N. Y.).....		Jan. 3, 1900
CUNNINGHAM, JOSEPH HOOKER		
Civ. and Hydr. Engr., Chamber of Commerce, Portland, Ore..		Sept. 6, 1899
CUSHING, ROBERT DELANO		
Chf. Engr.'s Office, N. Y. C. & H. R. R., Grand Central Station, New York City.....		Sept. 6, 1899
DALRYMPLE, FRANCIS WHARTON		
City Engr., City Hall, Jamestown, N. Y.....		Feb. 7, 1894
DAVIS, ARTHUR LINCOLN		
Asst. to Pres., American Bridge Co. of New York, 100 Broadway, New York City.....	Jun. Assoc. M.	April 4, 1893 Oct. 7, 1896
DAVIS, CARLETON EMERSON		
Res. Engr., Cedar Grove Reservoir, Dept. of Water, Newark, N. J.		April 6, 1898
DAVIS, HAROLD		
1457 Stoughton St., Washington, D. C.....		Oct. 2, 1901
DAVIS, WILLIAM RUSSELL		
Chf. Bridge Designer and Insp., Office of State Engr. and Surv. of New York, State Hall, Albany, N. Y.....		May 2, 1900
DEANS, CHARLES HERBERT		
Montrose, Susquehanna Co., Pa.....	Jun. Assoc. M.	Dec. 3, 1890 May 6, 1896
DE FOREST, GEORGE THOMPSON		
De Freestville, N. Y.		Dec. 4, 1895
DESPARD, DUNCAN LEE		
2125 Delancey St., Philadelphia, Pa.....		Feb. 3, 1897
DE WITT, ELMORE		
Civ. Engr. for The Pennsylvania Steel Co. (Res., 348 Spruce St.), Steelton, Pa		Oct. 5, 1898
DIEBITSCH, EMIL		
Engr. and Supt. for John Peirce, 277 Broadway (Res., 80 Washington Sq.), New York City.....	Jun. Assoc. M.	Feb. 28, 1893 Oct. 6, 1897

ASSOCIATE MEMBERS.

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Date of
Membership.

DILLON, FRANCIS HENRY	(Mackin & Dillon, Civ. Engrs. and Contrs.) Apartado 221, Monterey, Mexico.....	Oct. 3, 1900
DIMON, DANIEL YOUNG	Designer and Estimator, American Bridge Co., Eng. Dept.,彭 coyd, Pa. (Res., 235 Rochelle Ave., Wissahickon, Philadelphia, Pa.)	Oct. 2, 1901
DINGLE, JAMES HERVEY	City Surv., Charleston, S. C.....	April 30, 1895
DOEBLER, VALENTINE SHERMAN	Asst. Engr., Cam. Steel Co., Johnstown, Pa.....	Oct. 4, 1899
DONHAM, BENJAMIN CURTIS	Chf. Engr., Collbran & Bostwick, Seoul, Corea.....	Dec. 6, 1893
DORRANCE, WILLIAM TULLY	Asst. Engr., N. Y. C. & H. R. R., 5 Vanderbilt Ave., New York City.....	Jan. 2, 1901
DOWNMAN, JULIAN ROMNEY	Mgr., Teche Construction Co., Jeanerette, La.....	Sept. 4, 1901
DRAKE, ROBERT MORRIS	Asst. Engr., M. of W. Dept., Southern Pacific Co., 3d and Townsend St. Depot, San Francisco, Cal.....	Dec. 4, 1901
DU BOIS, JULIAN	Supt., Amsterdam St. R. R. Co., Amsterdam, N. Y.....	Mar. 7, 1900
DUNN, EMMETT CLARKE	City Engr., Alexandria, Va.....	Jan. 8, 1902
DYER, ARTHUR JAMES	422 Jackson Bldg., Nashville, Tenn.....	Nov. 4, 1891
EASTWOOD, JOHN THOMPSON	Asst Engr., Sewerage and Water Board, 602 Caron- delet St., New Orleans, Lu.....	Mar. 6, 1901
EAVENSON, HOWARD NICHOLAS	Div. Engr., Continental Coke Co., Uniontown, Pa.....	Jun. 4, 1894
EDER, HENRY JAMES	Palmira, Caucia, Republic of Colombia.....	Assoe. M. Feb. 1, 1899
EDWARDS, FREDERICK	Instr. in Civ. Eng. and Math., Union College, Schenectady, N. Y.....	Jun. 1, 1897
EDWARDS, WARRICK RIGELEY	Chf. Insp. of Bridge Material, B. & O. R. R., Mt. Royal Station, Baltimore, Md.....	Assoe. M. Jan. 31, 1899
EHLE, BOYD	Prin. Asst. Engr., Isthmian Canal Comm. (Res., East Creek, N. Y.)	Feb. 5, 1902
ELDRIDGE, GRIFFITH MORGAN	Supt., Tampa Water-Works Co., Tampa, Fla.....	April 4, 1900
ELLIOTT, JAMES RUTHERFORD	Room 13, Westinghouse Bldg., Pittsburg, Pa.....	June 3, 1894
		Sept. 1, 1892
		Sept. 4, 1901

		Date of Membership.
ELLIOTT, JOHN STUART	1820 Jefferson Pl., Washington, D. C.....	April 6, 1892
ENDEMANN, HERMAN KARL	Asst. Engr. in Chg. of Subdivision "A," Topographical Bureau, Board of Public Impvts., New York City; 85 Borden Ave., Long Island City, N. Y.....	Mar. 6, 1901
ENGSTRÖM, FRANS	Civ. Engr. with Carnegie Steel Co., 3721 Bouquet St., Pittsburg, Pa.....	May 4, 1892
EVANS, JOHN MAURICE	Insp. of Erection, New East River Bridge, 598 Bedford Ave., Brooklyn, N. Y.	Jun. May 4, 1897 Assoc. M. Jan. 3, 1900
EVANS, MYRON EDWARD	(Ballantyne & Evans, Archts. and Engrs.) 20 Nassau St., New York City	Jun. Jan. 3, 1895 Assoc. M. Feb. 7, 1900
EVANS, PETER PLATTER	Contr. Engr., The Osborn Engineering Co., Osborn Bldg., Cleveland, Ohio.....	Jun. Feb. 6, 1894 Assoc. M. Mar. 7, 1900
FAIRCHILD, JOHN FLETCHER	Bank of Mt. Vernon Bldg., Mt. Vernon, N. Y.....	Jun. April 5, 1892 Assoc. M. Dec. 4, 1895
FARLEY, PHILIP PATRICK	980 De Kalb Ave., Brooklyn, N. Y.	Jun. Oct. 31, 1893 Assoc. M. Mar. 6, 1901
FARQUHAR, HENRY STILSON	229 East German St., Baltimore, Md.....	Jun. April 5, 1892 Assoc. M. Nov. 4, 1896
FARRINGTON, HARVEY	Asst. Engr., Dept. of Docks and Ferries, Pier "A," Battery Pl., New York City (Res., Croton-on-Hudson, N. Y.).	Jun. June 19, 1891 Assoc. M. Feb. 6, 1895
FAY, EDWARD BAYRD	(Brenneke & Fay, Cons. Civ. Engrs.), 1000 Fullerton Bldg., St. Louis, Mo.....	Jan. 8, 1902
FERGUSON, JOHN NEIL	Asst. Engr., Met. Water-Works, 1 Ashburton Pl., Boston, Mass.	Oct. 2, 1901
FERRIS, FREDERICK EDWARD	Surv., Eng. Bureau, Board of Street and Water Commrs., Room 21, City Hall, Jersey City, N. J.....	June 1, 1898
FICKES, EDWIN STANTON	Chf. Engr. and Purchasing Agt., The Pittsburgh Reduction Co., Pittsburgh, Pa.....	Jun. Jan. 4, 1898 Assoc. M. Feb. 6, 1901
FISH, JOHN CHARLES LOUNSBURY	Assoc. Prof. of Civ. Eng., Box 20, Palo Alto, Cal....	Jun. Jan. 31, 1893 Assoc. M. Feb. 7, 1900
FISHER, ELSTNER	Gen. Supt. and Chf. Engr., T. H. & B. Ry., Hamilton, Ont., Canada.....	Jun. April 3, 1889 Assoc. M. June 2, 1897
FITZGERALD, CHRISTOPHER COLUMBUS	Roadmaster, Cincinnati Div., C. N. O. & T. P. Ry. Co., Lexington, Ky....	Oct. 2, 1901

Date of
Membership.

FLINN, ALFRED DOUGLAS			
Prin. Office Asst., Eng. Dept., Met. Water-Works, Boston; Instr. in San. Eng., Lawrence Scientific School, Harvard Univ., 1 Ashburton Pl., Boston, Mass.....		Dec. 6, 1899	
FLYNN, JOHN, JR.			
Elec. and Civ. Engr., 83 Third St., Troy, N. Y.....		Jan. 8, 1902	
FOCHT, LOUIS			
Engr. to the State Board of Assessors, Trenton, N. J.; Chf. Engr., Carteret Construction Co., Rahway, N. J. (Res., 105 East Hanover St., Trenton, N. J.).....		May 4, 1892	
FORD, ROBERT HENRY PERSSE	{ Jun.	Mar. 2, 1897	
Asst. Engr., Central Vermont Ry., St. Albans, Vt.	{ Assoc. M.	June 7, 1899	
FORT, EDWIN JOHN			
Dept. of Highways, Municipal Bldg., Brooklyn, N. Y.....		April 1, 1896	
FORTIN, SIFROY JOSEPH			
(Representative, Milliken Bros., 11 Broadway, New York City) P. O. Box 678, Honolulu, Hawaiian Islands.....		Nov. 6, 1895	
FOSTER, THOMAS J			
Mgr., Structural Dept., National Bridge Co., 45 Broadway, New York City.....		Feb. 1, 1899	
FOX, WALTER GORDON			
Div. Engr., Guayaquil & Quito Ry., Guayaquil, Ecuador.....		Jan. 2, 1901	
FOYE, ANDREW ERNEST	{ Jun.	May 2, 1893	
11 Broadway, New York City.....	{ Assoc. M.	Nov. 4, 1896	
FRANCIS, WALTER JOSEPH			
Res. Engr., Trent Canal, Peterborough, Ont., Canada.....		May 1, 1901	
FRAZEE, JOHN HATFIELD			
Res. Engr., Manufacturers' Contracting Co., Dallas, Tex.....		Dec. 6, 1899	
FREASE, HARRY			
Chf. Engr., The Canton & East Liverpool Ry. Co., Canton, Ohio.		May 6, 1891	
FREITAG, JOSEPH KENDALL			
New England Agt., Hecla Iron Works, 166 Devonshire St., Bos- ton, Mass.....		Jan. 3, 1900	
FRENCH, ARTHUR WILLARD			
Prof. of Civ. Eng., Worcester Polytechnic Inst., Worcester, Mass.		April 4, 1900	
FREW, ROBERT DICKSON ALISON			
Chelmer, near Brisbane, Queensland, Australia		June 1, 1898	
FREYHOLD, FELIX			
Draftsman, Bureau of Yards and Docks, Navy Dept., 236 First St., S. E., Washington, D. C.....		Sept. 2, 1891	
FRICK, WALTER			
Supt. and Engr., Consolidated Water Supply Co., Carbondale, Pa.....		Dec. 2, 1896	
FRINK, FRED GOODRICH			
3242 Groveland Ave., Chicago, Ill.....		May 3, 1899	
FULLER, GEORGE WARREN			
(Rudolph Hering & George W. Fuller, Hydr. Engrs. and San. Experts), 100 William St., New York City.....		Mar. 1, 1899	

Date of
Membership.

GARDINER, FREDERICK WILLIAM			
Asst. Engr., Manhattan Ry. Co., 195 Broadway, New York City.	Dec.	6, 1899	
GARRETT, JOHN THOMAS			
Bridge Engr., 715 Locust St., St. Louis, Mo.....	May	1, 1901	
GARRETT, ROBERT PEEL			
Civ. Engr. of Board of Public Impvts., 301 New City Hall, St. Louis, Mo.....	Jun. Assoc. M.	Jan. Oct. 4, 1898 2, 1901	
GARRISON, FRANK LYNWOOD			
Min. Engr., 1019 Clinton St., Philadelphia, Pa.....	Sept.	7, 1892	
GERRY, MARTIN HUGHES, Jr.			
Chf. Engr. and Gen. Mgr., Missouri River Power Co., Helena, Mont.....	June	6, 1900	
GILKEY, THOMAS ALVIN			
Railway Bridge Dept., American Bridge Co., 51st and Butler Sts., Pittsburg, Pa.....	Oct.	3, 1900	
GILLESPIE, RICHARD HENWOOD			
Asst. Engr., Dept. of Highways, Borough of the Bronx (Res., 726 East 179th St.), New York City.....	Oct.	3, 1900	
GILLIS, HARRY ALEXANDER			
Gen. Supt., Richmond Works, American Locomotive Co., Richmond, Va.....	June	5, 1895	
GODDARD, LESLIE WARREN			
U. S. Asst. Engr., Grand Rapids, Mich.....	Mar.	2, 1892	
GOLDSMITH, NATHANIEL OLIVER			
Vice-Pres., The Wefugo Co.; Treas., The American Coke Drawer Co., Cincinnati, Ohio.....	Jun. Assoc. M.	June 2, 1886 June 6, 1900	
GOODNOUGH, XANTHUS HENRY			
Chf. Engr., State Board of Health, Room 140, State House, Boston, Mass.....	May	6, 1896	
GRANDY, ALBION LORENZO			
Superv., Erie R. R. Co.; Address, 217 Spicer St., Akron, Ohio	April	4, 1900	
GRANT, THOMAS HENRY			
Red Bank, N. J.....	May	6, 1891	
GRANTHAM, HERBERT THOMAS			
Structural Engr., 1622 Real Estate Trust Bldg., Philadelphia, Pa.	Feb.	5, 1896	
GRAVELLE, ALVIN			
Care, American Bridge Co., Milwaukee, Wis.....	Nov.	6, 1901	
GRAY, EDWARD, Jr.			
Asst. Engr., C. & O. Ry. Co., Hinton, W. Va.....	Jan.	2, 1895	
GRAY, WILLIAM			
Asst. Engr., Bureau of Sewers, Borough of the Bronx, New York City.....	Jun. Assoc. M.	May 2, 1888 Mar. 1, 1893	
GREEN, ANDREW H			
403 La Salle Ave., Chicago, Ill.....	Oct.	2, 1901	
GREEN, RUTGER BLEEKER			
The Solvay Process Co., Detroit, Mich.....	Jun. Assoc. M.	May 5, 1896 Oct. 5, 1898	
GREENALCH, WALLACE			
Deputy City Engr., Albany, N. Y.....	Jun. Assoc. M.	April 3, 1894 June 7, 1899	

GREENE, CARLETON (Greene & Greene, Cons. Engrs.), 11 Broadway, New York City ..	Mar.	3, 1897
GREENE, FREDERICK STUART 311 West 82d St., New York City	June	7, 1899
GREENE, HOWARD ARNOLD 7 West 22d St., New York City	June	5, 1895
GREENE, ROBERT MAXSON Architectural Engr., 102 Waverly Pl., New York City.....	June	1, 1898
GREGORY, CHARLES EMERSON 160 West 119th St., New York City.....	{ Jun. Assoc. M.	Oct. 6, 1896 Mar. 6, 1901
GREGORY, JOHN HERBERT Asst. Engr. in Chg. of Designs, Impvt., Extension and Filtration of Water Supply, 710 City Hall, Philadelphia, Pa.....	{ Jun. Assoc. M.	Jan. 3, 1899 April 3, 1901
GRIFFITH, LAWRENCE Superv. of Track and Signals, Grand Central Station Terminal, Grand Central Station, New York City (Res., 7 Lincoln Terrace, Yonkers, N. Y.).....	May	2, 1900
GROSS, DANIEL WINGERD Chf. Engr., Lake Shore Electric Ry., Fremont, Ohio.....	May	1, 1901
GUBELMAN, FREDERICK JOSEPH Vice-Pres. and Chf. Engr., The T. A. Gillespie Co., 71 Broadway, New York City.....	Oct.	2, 1895
GUDEWILL, CHARLES EDWARD Vice-Pres., Montreal Pipe Foundry Co., P. O. Box 2304, Mon- treal, Que., Canada.....	Sept.	1, 1897
GUDMUNDSSON, GISLI Asst. to Hermann Laub, 610 Lewis Blk., Pittsburg, Pa.....	Jan.	3, 1900
HAAS, EDWARD FRANCIS 320 Sansome St., San Francisco, Cal.....	{ Jun. Assoc. M.	Feb. 6, 1894 Sept. 5, 1900
HAGAR, EDWARD MCKIM Mgr., Cement Dept., Illinois Steel Co., 1060 The Rookery, Chicago, Ill.....	Feb.	6, 1901
HAIN, JAMES C 1100 Old Colony Bldg., Chicago, Ill.....	May	1, 1901
HAINES, EUGENE GROVE Res. Engr., Atlantic Ave. Impvt., L. I. R. R., Div. No. 1, 5 Hanson Pl., Brooklyn, N. Y.....	May	1, 1901
HALLIHAN, JOHN PHILIP Res. Engr., Railway Dept., Cananea Cons. Copper Co., Naco, Ariz.....	April	4, 1900
HAMMATT, WILLIAM CUSHING Engr. for Guggenheim Exploration Co., Minas Fecolotes y Anexas, Santa Barbara, Chihuahua, Mexico.....	Sept.	5, 1900
HANNA, JOHN HUNTER Asst. Chf. Engr. and Supr., Capital Traction Co., Washington, D. C.....	April	3, 1901

		Date of Membership.
HANNA, JOHN VENABLE		
Asst. Chf. Engr., Frisco System; Address Care, Frisco System, North Side Office, Springfield, Mo.....	May	3, 1893
HARAHAN, WILLIAM JOHNSON		
Chf. Engr., Illinois Central R. R., Chicago, Ill.....	Oct.	3, 1894
HARDISON, ALLEN CROSBY		
Supt., Gladiator Mine, Prescott, Ariz.....	Feb.	6, 1901
HARDY, HARRY		
Sevilla House, 7 Colville Terrace, Bayswater, London, W., England	June	1, 1892
HARMAN, JACOB ANTHONY		
Civ. and San. Engr., 109 S. Jefferson Ave., Peoria, Ill.....	May	4, 1898
HARRINGTON, FERDINAND FINNEY		
251 Eightieth St., Bay Ridge, Brooklyn, N. Y.....	May	3, 1899
HARRINGTON, JOHN LYLE	{ Jun.	Aug. 31, 1897
C. W. Hunt Co., West New Brighton, N. Y.....	{ Assoc. M.	Oct. 4, 1899
HARRIS, VAN ALEN	{ Jun.	Nov. 6, 1894
Yanco, Porto Rico	{ Assoc. M.	Oct. 5, 1898
HARTE, CHARLES RUFUS		
Chf. Engr., Cape Breton Electric Co., Ltd., Sydney,	{ Jun.	April 4, 1899
Cape Breton, N. S., Canada.....	{ Assoc. M.	May 2, 1900
HAITWELL, HARRY		
Chf. Engr. of Constr., The São Paulo Tramway, Light & Power Co., Ltd., São Paulo, Brazil	{ Jun. { Assoc. M.	Jan. 2, 1894 Feb. 2, 1898
HARWOOD, GEORGE ALEC		
Chf. Draftsman, N. Y. C. & H. R. R. R., 521 Grand Central Station, New York City.....	Feb.	5, 1902
HAUCK, WILLIAM		
1161 Amsterdam Ave., New York City	June	5, 1901
HAWES, LOUIS EDWIN		
Civ. and Hydr. Engr., 73 Tremont St., Boston, Mass.....	Sept.	2, 1896
HAWLEY, GEORGE PRINCE		
Res. Engr., Shawenegan Water & Power Co., Shawenegan Falls, Qne., Canada	Feb.	6, 1901
HAWLEY, WILLIAM CHAUNCEY	{ Jun.	Oct. 1, 1890
Engr. and Supt., Water Dept., Atlantic City, N. J..	{ Assoc. M.	April 6, 1892
HAYCROFT, JAMES ISAAC		
Fontenoy, Ocean St., Woollahra, New South Wales, Australia...	Jan.	3, 1894
HAYDEN, JOHN BRUCE		
Asst. Engr., Dept. of Bridges and Bldgs., B. & O. R. R., Mt. Royal Station, Baltimore, Md.....	May	2, 1900
HAYES, GEORGE SAMUEL	{ Jun.	Dec. 6, 1892
111 Fifth Ave., New York City.....	{ Assoc. M.	June 3, 1896
HAYFORD, JOHN FILLMORE		
Insp. of Geodetic Work and Chf. of Computing Div., Coast and Geodetic Survey, Washington, D. C.....	May	6, 1896
HAZARD, ERSKINE		
Chf. Surv., Lancaster Gold Mining Co., and Lancaster West Gold Mining Co., Box 994, Johannesburg, South Africa.....	Oct.	2, 1895

HAZLETT, ROBERT		
City Bank Bldg., Wheeling, W. Va.....	Mar.	4, 1896
HEINDLE, WILLIAM ALBERT		
Asst. Engr., J. G. White & Co., Ltd., 22a College Hill, Cannon St., London, E. C., England.....	Nov.	6, 1901
HELM, EDWIN GUY		
Civ. and Cons. Engr., 209 Arcade, East St. Louis, Ill.....	Dec.	5, 1900
HEMMING, DUNKIN WIRGMAN		
201 West 106th St., New York City.....	Sept.	7, 1892
HENDRICKS, VICTOR KING		
Engr., M. of W., T. H. & L. Ry. Co., Logansport, Ind.....	May	1, 1895
HENRY, FRANCIS MAXWELL		
500 Lumber Exchange, Minneapolis, Minn.....	Mar.	4, 1896
HENRY, PHILIP WALTER		
Vice-Pres. and Gen. Mgr., The Barber Asphalt Paving Co., 11 Broadway, New York City.....	Jan.	3, 1894
HERRICK, JOHN JAMES		
161 Franklin Pl., Flushing, N. Y.....	June	6, 1900
HERRING, WILLARD E		
Res. Engr., C., O. & G. Ry., Little Rock, Ark.....	Sept.	4, 1901
HIGHLEY, LEE		
B. and B. Dept., Mo. Pac. Ry., Pacific, Mo.....	{ Jun. Assoc. M.	{ Dec. 7, 1897 Dec. 4, 1901
HILL, CURTIS		
Sewer Dept., City Hall, St. Louis, Mo.....	Oct.	2, 1901
HILL, EDWIN ALLSTON		
Asst. Examiner, Classification Div., U. S. Patent Office, Wash- ington, D. C	May	3, 1893
HILL, JOHN EDWARD		
Prof. of Civ. Eng., Brown Univ., Providence, R. I.....	May	4, 1892
HILL, THEODORE WILLIAM		
Res. Engr. in Chg. of Sewer Constr., Sidney, Ohio.....	Mar.	7, 1900
HILL, WALTER ARTHUR		
Roadmaster, Mexican National R. R., San Luis Potosi, San Luis Potosi, Mexico	Sept.	2, 1896
HILLIARD, FOSTER HAVEN		
Lock Box 217, Memphis, Tenn.....	Mar.	6, 1901
HITE-SMITH, VAN DUSEN		
Civ. and San. Engr., Knoxville, Tenn.....	April	3, 1901
HOBBY, ARTHUR STANLEY, Jr.		
Prin. Asst. Engr., Dist. of Santiago, Santiago de Cuba, Cuba...	Sept.	4, 1901
HOFFMANN, ROBERT		
Asst. Engr., Dept. of Public Works, Div. of Sewers and Drains, 55 Osborn St., Cleveland, Ohio.....	June	5, 1901
HOGUE, CHARLES JAY		
Asst. Engr., C., O. & G. R. R., Little Rock, Ark.....	Dec.	7, 1898
HOLBROOK, PERCY		
Gen. Mgr., The Weber Ry. Joint Mfg. Co., New York City ...	Mar.	2, 1898

Date of
Membership.

HOLMES, GLENN DICKINSON

Asst. Engr., Impvt., Extension and Filtration of the Water Supply, Lower Roxborough Filter Plant, Roxborough, Philadelphia, Pa..... June 5, 1901

HOMAN, WILLIAM MACLEAN

Care, D. McCall, 10 Rosslyn Terrace, Kelvinside, Glasgow, Scotland..... June 7, 1899

HONE, FREDERIC DE PEYSTER (Chambers & Hone), 60 New St., New York City.... { Jun. Assoc. M. April 4, 1899 Feb. 5, 1902

HONENS, FREDERICK WILLIAM

U. S. Insp., Illinois and Mississippi Canal, Sterling, Ill..... April 3, 1901

HONNESS, GEORGE GILL Asst. Engr., East Jersey Water Co., 109 Washington St., Paterson, N. J..... { Jun. Assoc. M. Feb. 2, 1897 Sept. 4, 1901

HOPKINS, ALBERT LLOYD

Asst. to Gen. Supt., Newport News Shipbuilding & Dry Dock Co., Newport News, Va..... { Jun. Assoc. M. April 3, 1894 April 3, 1901

HORTON, THEODORE

Prin. Office Asst. with Rudolph Hering and George W. Fuller, Hydr. Engrs. and San. Experts, 100 William St., New York City..... { Jun. Assoc. M. Aug. 31, 1897 April 4, 1900

HOUSTON, GAVIN NELSON

Care, Colorado Fuel & Iron Co., Placita, Colo..... { Jun. Assoc. M. May 4, 1897 Nov. 7, 1900

HOWARD, CHARLES POPE

Quinnimont, W. Va..... Jan. 3, 1894

HOWARD, JOHN LEWIS

Div. Engr., Met. Water and Sewerage Board, 1 Ashburton Pl., Boston, Mass..... Dec. 7, 1898

HOYT, JOHN T NOYE 349 Madison Ave., New York City..... { Jun. Assoc. M. Feb. 28, 1893 Mar. 2, 1898

HUBBELL, CLARENCE WILLIAM

Civ. Engr. to Board of Water Commrs., 232 Jefferson Ave., Detroit, Mich..... { Jun. Assoc. M. May 31, 1898 April 4, 1900

HUESTIS, CHARLES CALVIN

Gen. Mgr., The T. H. Riddle Construction Co., Clearfield, Pa.. Mar. 6, 1901

HUMPHREY, HENRY CYPRIAN

(Tracy & Humphrey, Civ. Engrs.) Syracuse, N. Y..... Sept. 4, 1901

HUMPHREY, RICHARD LEWIS

Engr. and Gen. Mgr., Buckhorn Portland Cement Co., Girard Bldg., Philadelphia, Pa..... May 5, 1897

HUMPHREYS, CLIFTON STEWART

(Snow & Humphreys, Mill Archts. and Engrs.), 85 Water St., Boston, Mass. (also Madison, Me.)..... May 2, 1900

HUNTER, ROBERT EASTON

644 St. Denis St., Montreal, Que., Canada..... Nov. 6, 1901

HUSTON, TILLINGHAST L'HOMMEDIEU

Mgr. for Cuba for Jas. B. Clow & Sons, 36 O'Bispo, Havana, Cuba. May 2, 1900

HUTCHINSON, CARY TALCOTT

Cons. Elec. Engr., 71 Broadway, New York City..... Mar. 4, 1896

ASSOCIATE MEMBERS.

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Date of
Membership.

INGRAM, EDWARD LOVERING			
Expert Aid (Civ. Engr.) Dept. of Yards and Docks, New York			
Navy Yard, N. Y.		Sept. 4, 1895	
IVES, ARTHUR STANLEY			
Civ. and Elec. Engr., R. D. Wood & Co., 400 Chestnut St., Philadelphia, Pa.	{ Jun. Assoc. M.	Jan. 7, 1896 Jan. 3, 1900	
JACKSON, JAMES MADISON			
Chf. Engr., Pkg. & Inter-Urban R. R. Co., Parkersburg, W. Va.		Jan. 2, 1901	
JACKSON, JOHN FRANKLIN			
Contr. Engr., Wisconsin Bridge & Iron Co., Houghton, Mich....		May 2, 1894	
JACOB, ALFRED PETER			
123 West 96th St., New York City.....		Oct. 7, 1896	
JACOBS, JOSEPH			
Asst. Gen. Bridge Insp., S. P. Co., Care, Gen. Offices, S. P. Co., San Francisco, Cal		Sept. 4, 1901	
JANNEY, THOMAS GORDON			
Supt., Bed Rock Dredging Co., Centerville, Idaho.....		Oct. 3, 1900	
JANVRIN, NED HERBERT			
Asst. Engr., American Bridge Co., Wissahickon, Philadelphia, Pa.	{ Jun. Assoc. M.	Oct. 5, 1897 June 5, 1901	
JARRETT, EDWIN SETON			
Cons. Engr., 71 Broadway, New York City.....		May 1, 1895	
JENCKES, LAWRENCE BATES			
Supt. of Public Works, Stamford, Conn.....	{ Jun. Assoc. M.	Mar. 31, 1891 Oct. 7, 1896	
JOHNSON, ALEXANDER			
Asst. Engr., New East River Bridge, Foot of Delancey St., New York City		Sept. 5, 1900	
JOHNSON, LEWIS JEROME			
Asst. Prof. of Civ. Eng., Harvard Univ., 309 Pierce Hall, Cambridge, Mass.....		Sept. 4, 1901	
JOHNSON, RANKIN			
Chf. Asst. Engr., Mex. Int. R. R., Santiago Papasquiaro, Durango, Mexico		Feb. 7, 1900	
JOHNSON, WILLIAM EDWARD			
Chf. Engr., Hartford Water Comm., P. O. Box 37, West Hartford, Conn.....		April 3, 1901	
JOHNSON, WILLIAM STONE			
Asst. Engr., Mass. State Board of Health, Room 140, State House, Boston, Mass.		June 6, 1894	
JONES, HENRY LLEWELLYN			
Contr. Engr. for Australasia, American Bridge Co., Sydney, New South Wales, Australia.....		Oct. 5, 1898	
JONSON, ERNST FREDRIK			
Care, Lewinson & Just, 128 West 42d St., New York City.....		Jan. 3, 1900	
JORDAN, WILLIAM FREDERICK			
Res. Engr., N. Y. C. & H. R. R. R., Grand Central Station, New York City.....		April 1, 1891	

		Date of Membership.
C. KAHN, JULIUS		
Chf. Engr., Kubo Mayoro Sulphur Mine, Japan; Care, Frazar & Co., Yokohama, Japan.....	{ Jun. Assoe. M.	May 3, 1898 Oct. 3, 1900
KEAYS, REGINALD HORTON	{ Jun.	June 6, 1899
Asst. Engr., Havana, 3 Tacon St., Havana, Cuba....	{ Assoe. M.	April 3, 1901
KELLER, CHARLES LINCOLN	{ Jun.	Oct. 4, 1898
First Asst. Engr., The Scherzer Rolling Lift Bridge Co., 1616 Monadnock Blk., Chicago, Ill.....	{ Assoe. M.	Mar. 6, 1901
KELLOGG, ALBERT VICTOR		
Locating Engr., H. & T. C. R. R. Co., Houston, Tex.....		Nov. 6, 1895
KENNEY, EDWARD FULBISTER		
Engr. of Tests, P. R. R. Co., Broad St. Station, Philadelphia, Pa.....	{ Jun. Assoe. M.	Nov. 3, 1896 May 3, 1899
KENYON, GEORGE CECIL		
Mersey Docks and Harbor Board; Private address, "Beau Coin," Almond's Green, West Derby, England		April 4, 1900
KETCHUM, MILO SMITH		
Asst. Prof. of Civ. Eng., Univ. of Illinois, Champaign, Ill.....		Sept. 4, 1901
KINSEY, FRANK WILMARTH		
Supt., Morris & Cummings Dredging Co., Portland, Me.....	{ Jun. Assoc. M.	Feb. 2, 1892 Dec. 7, 1898
KNAP, EDGAR DAY		
Asst. Engr., New East River Bridge, 84 Broadway, Brooklyn, N. Y.....	{ Jun. Assoe. M.	Dec. 1, 1896 Dec. 4, 1900
KNIGHT, FRANK BARR		
Asst. Engr., Lidgerwood Mfg. Co., 96 Liberty St., New York City.....		Sept. 4, 1901
KNOCH, JULIUS JAMES		
Prof., Civ. Eng., Univ. of Arkansas, Fayetteville, Ark..		Oct. 2, 1901
KNOWLES, MORRIS	{ Jun.	Oct. 4, 1892
Res. Engr., Bureau of Filtration, Pittsburg, Pa.	{ Assoc. M.	Jan. 1, 1896
KOENIG, ARNOLD CHARLES		
Civ. and Hydr. Engr., Room 904, N. Y. Life Bldg., Omaha, Nebr.		Nov. 7, 1900
KOPS, JULIAN DE BRUYN		
Asst. City Engr., Savannah, Ga.....		April 4, 1894
KYLE, GEORGE ALLAN		
1310 North 6th St., Tacoma, Wash		May 6, 1891
LAMBERT, WALLACE CORLISS		
Asst. Engr., New England Structural Co., in Chg. of Designs and Estimates, 18 Post Office Sq., Boston, Mass.....		April 4, 1900
LATHBURY, BENJAMIN BRENTNALL		
(Lathbury & Spackman), 1619 Filbert St., Philadelphia, Pa.....		Mar. 3, 1897
LATTA, HARRISON WAINWRIGHT		
Pres., Latta & Terry Co., Engrs. and Contrs., 1001 Chestnut St., Philadelphia, Pa		Sept. 5, 1900
LAVIS, FRED		
Locating Engr., Choctaw, Oklahoma & Gulf R. R., Hartshorne, Ind. T.....		Sept. 6, 1899

ASSOCIATE MEMBERS.

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		Date of Membership.
LAWLOR, THOMAS FRANCIS	{ Jun.	June 5, 1889
St. Paul Bldg., 220 Broadway, New York City.....	{ Assoc. M.	May 2, 1894
LAWTON, PERRY	{ Jun.	Jan. 3, 1893
7 Savings Bank Bldg., Quincy, Mass.....	{ Assoc. M.	Sept. 2, 1896
LEAVITT, CHARLES WELLFORD, Jr.		
15 Cortlandt St., New York City		Jan. 4, 1898
LEE, DAVID READ		
Care, Water Commrs., Middletown, N. Y.....		Oct. 7, 1896
LEEPER, JOHN BIGGER		
Asst. Engr., American Bridge Co., 51st St., Pittsburg, Pa.....		Jan. 3, 1900
LEFFINGWELL, FRANK DODGE		
Asst. Engr., Dept. of Water Supply, Gas and Electricity, 13 Park Row, New York City.....		Oct. 5, 1898
LENTILHON, EUGENE	{ Jun.	Mar. 1, 1891
Contr. Engr., 489 Fifth Ave., New York City.....	{ Assoc. M.	Mar. 6, 1895
LEPPER, FRED WILLIAM		
Structural Engr., U. S. Treasury Dept., Washington, D. C.		Jan. 2, 1901
LEWERENZ, ALFRED COURTNEY		
Civ. Engr., U. S. N., U. S. Naval Station, New London, Conn.....	{ Jun. Assoc. M.	Mar. 5, 1895 June 6, 1900
LION, LÉON ÉLIE		
Asst., U. S. Engr. Office, 1010 Burgundy St., New Orleans, La.....	{ Jun. Assoc. M.	Feb. 1, 1898 April 4, 1900
LLEWELLYN, FREDERICK THOMAS		
9th Floor, Koken Bldg., St. Louis, Mo.		Oct. 4, 1899
LOCKE, WILLIAM WILLARD		
San. Insp., Met. Water and Sewerage Board, 5 Myrtle St., South Framingham, Mass.....		Oct. 6, 1897
LOCKWOOD, WILLARD DATUS		
Corps of Engrs., U. S. A., 812 St. Paul St., Balti- more, Md.....	{ Jun. Assoc. M.	April 3, 1894 Oct. 7, 1896
LONG, EUGENE McLEAN		
309 Broadway, New York City.....		June 1, 1898
LOOKER, HENRY BRIGHAM		
Surv. of the Dist. of Columbia, Surv.'s Office, Washington, D. C.		May 3, 1893
LOW, GEORGE EVARTS	{ Jun.	Nov. 6, 1894
45 Broadway, New York City.....	{ Assoc. M.	Mar. 2, 1898
LOWINSON, OSCAR		
Cons. Archt. and Engr., 39 Cortlandt St., New York City	{ Jun. Assoc. M.	May 3, 1892 Feb. 7, 1900
LUDWIG, JULIUS ALFRED		
1410 Havemeyer Bldg., 26 Cortlandt St., New York City	{ Jun. Assoc. M.	May 31, 1892 Oct. 2, 1895
LUND, GEORGE ALFRED		
Contr. Mgr., American Bridge Co., New Haven, Conn.....		Nov. 7, 1894
LUSTER, WILLIAM HENRY, Jr.		
City Surv., City Hall, Elizabeth, N. J.		Oct. 3, 1900

		Date of Membership.
LYLE, WILLIAM THOMAS	Vailsburg, Essex Co., N. J.....	Nov. 6, 1901
LYNCH, TILLMAN DANIS	Insp. of Materials, Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.....	Nov. 3, 1897
LYON, WALLACE CHITTENDON	Asst. Structural Engr., Care, Superv. Archt., Treasury Dept., Washington, D. C.....	Feb. 6, 1901
MACGREGOR, ROBERT ATHOLE	Asst. Engr., Dept. of Highways, Borough of the Bronx, New York City.....	Nov. 2, 1898
MACLEOD, GEORGE	Gen. Mgr. and Chf. Engr., L. & A. R. R.; Acting Receiver, New Albany Ry. Co.; Supt., Kentucky & Indiana Bridge Co., Louisville, Ky.....	Sept. 1, 1897
MACNAB, GEORGE TRAVILLA	Asst. Engr., Highways, Borough of the Bronx, 106 West 130th St., New York City.....	Feb. 3, 1897
MACNEILLE, PERRY ROBINSON	155 William St., Orange, N. J.....	April 5, 1898 Jun. Assoc. M.
McCAUSTLAND, ELMER JAMES	Prof. of Civ. Eng., School of Mines, Rolla, Mo.....	June 5, 1901 Sept. 5, 1900
McCCLURE, JOHN CLARENDRD	Asst. Engr., S. P. Co. (M. of W. Dept.), Arcade Depot, Los An- geles, Cal.....	Feb. 6, 1895
McCORMACK, EDGAR WALTER	Chf. Engr., Nipe Bay Syndicate, Mayari, Prov. Santiago, Cuba.	Mar. 6, 1901
McCREA, JAMES ALEXANDER	Supt., Cincinnati Div., Pennsylvania Lines West { Jun. of Pittsburgh, Cincinnati, Ohio.....	Nov. 1, 1898 Assoc. M. Nov. 7, 1900
McCULLOCH, RICHARD	Asst. Gen. Mgr., Chicago City Ry. Co., 2020 State St., Chicago, III.....	Mar. 2, 1898
McGEE, VAN NORMAN	Prof. of Railroad Eng., Imperial Nanyang College, Shanghai, China.....	June 6, 1900
MC GUIRE, JAMES CLARK	Engr. and Contr., 26 Cortlandt St., New York City ..	May 5, 1891 Jun. Assoc. M. Jan. 5, 1898
McKEAN, REGINALD	Box 68, Sherman, Tex	May 2, 1894
MCKENNEY, CHARLES ALBERT	Supt. of Constr., Trumbull St. Pumping Station { Jun. (Res., "The Iowa"), Washington, D. C.....	Dec. 4, 1894 Assoc. M. Dec. 1, 1897
MCKENZIE, THOMAS	P. O. Box 712, Westerly, R. I.....	May 2, 1893 Jun. Assoc. M. Nov. 6, 1895
MCKIBBEN, FRANK PAPE	Instr. in Civ. Eng., Mass. Inst. of Technology, Boston, Mass.....	Jan. 3, 1895 Jun. Assoc. M. Mar. 6, 1901

		Date of Membership.
McMEEKIN, CHARLES WILLIAM		
Second Vice-Pres. and Cons. Engr., Britannia Cop- per Syndicate, Ltd., Vancouver, B. C., Canada..	{ Jun. Assoc. M.	April 2, 1890 Mar. 7, 1894
McREYNOLDS, ORVAL OMAR		
(Middleton & McReynolds, Civ. and Min. Engrs.), 709 Equitable Bldg., Denver, Colo.....		Dec. 5, 1900
MAGOR, HENRY BASIL	{ Jun.	April 30, 1895
Cons. Engr., 29 Broadway, New York City.....	{ Assoc. M.	Mar. 7, 1900
MALUKOFF, ALEXIS JOSEPH		
With Rapid Transit R. R. Comm., 320 Broadway (Res., 72 West 131st St.), New York City.....		Jan. 2, 1901
MANNING, ROLLO GLENROY		
Engr., Toledo Plant, American Bridge Co., 1303 Utah St., To- ledo, Ohio.....		Oct. 2, 1901
MARDEN, WALTER REUBEN		
119 Sumac St., Wissahickon, Philadelphia, Pa.....		April 4, 1894
MARQUAND, PHILIP		
Partner of Allen, Sand & Co., Bankers, 7 Pine St., New York City ..		Oct. 5, 1898
MARSTON, ANSON		
Prof. of Civ. Eng. and College Engr., Iowa State College, Ames, Iowa ..		Oct. 4, 1893
MARSTON, FRANK LEONARD		
49 Hammond St., Bangor, Me.....		Oct. 2, 1901
MARTIN, JAMES WILLIAM		
Asst., Eng. Dept., Colorado Fuel & Iron Co., 926 Lake Ave., Pueblo, Colo.....		Nov. 1, 1899
MARTIN, KINGSLEY LEVERICH	{ Jun. Assoc. M.	Nov. 5, 1895 May 3, 1899
Res. Engr., New East River Bridge, 84 Broadway, Brooklyn, N. Y.....		
MASON, GEORGE COTNER	{ Jun. Assoc. M.	Mar. 6, 1894 May 3, 1899
Asst. Prof. of Civ. Eng., New York Univ., Univer- sity Heights, New York City.....		
MATHEWSON, ISAAC		
Ingeniero del F. C. M. C. y P., Apartado 704, City of Mexico, Mexico ..		Mar. 7, 1894
MATTHES, FRANCOIS EMILE		
Topographer, U. S. Geological Survey, Washington, D. C.....		April 3, 1901
MATTHES, GERARD HENDRIK		
Asst. Hydrographer, U. S. Geological Survey, Washington, D. C.		June 6, 1900
MAYER, AUGUST		
810 Jordan St., Shreveport, La.....		June 1, 1892
MEAD, CHARLES ADRIANCE		
236 North 6th St., Newark, N. J.....		April 5, 1899
MEEM, JAMES COWAN		
Asst. Engr., Rapid Transit R. R. Comm., 39 Broadway, New York City (Res., 395 Ocean Ave., Brooklyn, N. Y)..		April 1, 1896
MESA, ANTONIO ESTEBAN		
33 West 118th St., New York City.....		Jan. 1, 1896

Date of
Membership.

METCALF, LEONARD	Civ. and Hydr. Engr., 14 Beacon St., Boston, Mass.....	Jan.	5, 1898
MILES, JOHN WILEY	Chf. Engr., Vera Cruz (Mex.) Rys., Ltd., Vera Cruz, Mexico...	Oct.	2, 1901
MILLARD, CHARLES STERLING	Engr., M. of W., Peoria & Pekin Union R. R., Peoria, Ill.....	{ Jun. Assoc. M.	May 2, 1899 June 5, 1901
MILLER, CLIFFORD NEVILLE	Asst. in Chg. of Chf. Engr.'s Office, Commissioners of Water-Works (Res., 21 San Rafael Bldg.), Cincinnati, Ohio	{ Jun. Assoc. M.	June 4, 1891 Feb. 5, 1896
MILLER, HEW	Civ. Engr. and Archt., 28 West 26th St., New York City.....	Mar.	3, 1897
MILLER, RUDOLPH PHILIP	141 East 40th St., New York City.....	{ Jun. Assoc. M.	Jan. 2, 1890 April 7, 1897
MILLER, SHREWSBURY BEAUREGARD	Care, Altoona Gas Co., Altoona, Pa.....	Jan.	4, 1893
MILLS, JOHN CHARLES	Care, Messrs. King, Hamilton & Co., Calcutta, India.....	Nov.	6, 1895
MINER, CHARLES AUGUSTINE	U. S. Asst. Engr., 2001 I St., N. W., Washington, D. C.....	April	7, 1897
MITCHELL, HORACE HULBURD	(Mitchell & Neff, Engrs. and Contrs.), 18 Ninth Ave., Newark, N. J.	Mar.	7, 1894
MOGENSEN, OLAF EINAR	Chf. Engr.'s Office, Missouri Pacific Ry. Co., St. Louis, Iron Mountain & Southern Ry. Co., and Leased, Operated and Independent Lines, 405 Equitable Bldg., St. Louis, Mo.....	April	7, 1897
MOISSEIFF, LEON SOLOMON	Asst. Engr., East River Bridges Nos. 3 and 4, Dept. of Bridges, Park Row Bldg., New York City.....	{ Jun. Assoc. M.	Dec. 3, 1895 Sept. 5, 1900
MOLER, WILLIAM GRIFFITH	Apartado 289, City of Mexico, Mexico.....	Jan.	3, 1900
MONCURE, WILLIAM AUGUSTUS	Real Estate Dept., P. R. R., Broad St. Station, Philadelphia, Pa.....	{ Jun. Assoc. M.	June 21, 1894 Oct. 7, 1896
R. MONTONY, LIBERTY GILBERT	128 Twelfth St., Troy, N. Y.....	{ Jun. Assoc. M.	May 3, 1892 Feb. 5, 1896
MOORE, WALTER SOTHORON	Engr., M. of W., C., C. & St. L. Ry., Galion, Ohio.....	Mar.	7, 1900
MOREY, RICHARD	809 N. Y. Life Bldg., Kansas City, Mo.....	Jan.	2, 1901
MORITZ, CHARLES HOLLAND	Constr. Engr., The Pittsburg Reduction Co., Niagara Falls, N.Y.	Oct.	2, 1901
MORRISON, EUGENE TAYLOR	1526 North 2d St., Harrisburg, Pa	Jan.	2, 1901
MORRISON, HARRY JOHNSON	Div. Engr., Met. Water-Works, 25 Leighton Ave., Clinton, Mass.....	Jan.	4, 1899

MORROW, JAY JOHNSON				
Capt., Corps of Engrs., U. S. A., Manila, Philippine Islands...		June	5, 1901	
MOSES, JOHN CRANCH				
Chf. Draftsman, The Boston Bridge Works, Inc., 70	Jun.	July	2, 1890	
Kilby St., Boston, Mass.....	{ Assoc. M.	May	4, 1898	
MOSES, PERCIVAL ROBERT				
Cons. Engr., 35 Nassau St., New York City.....		Oct.	3, 1900	
MOSS, ROBERT EDWARD				
271 Broadway, New York City.....		May	2, 1900	
MOTT, DANIEL LIVERMORE				
Room 75, Arcade Bldg., Utica, N. Y.....		April	6, 1898	
MURPHY, EDWARD CHARLES				
Hydrographer, U. S. Geological Survey, 130 Hazen St., Ithaca, N. Y.....		Sept.	5, 1900	
MYERS, EDWARD WARREN				
Civ. and Hydr. Engr : Res. Hydrographer, U. S. Geological Survey, Greensboro, N. C.....		Oct.	2, 1901	
MYERS, JOHN HAYS				
Asst. Engr., New York Rapid Transit R. R. Comm.,	Jun.	Dec.	5, 1893	
147 Columbus Ave., New York City.....	{ Assoc. M.	Oct.	5, 1898	
NAGLE, JAMES C				
Prof. of Civ. Eng., Agricultural and Mechanical College of Texas, College Station, Tex.....		April	5, 1899	
NELSON, WILLIAM				
Laconia, N. H.....		June	6, 1900	
NEUMAYER, ROBERT ENGLER				
Borough Engr. of Bethlehem and South Bethlehem,	Jun.	May	31, 1892	
Pa.; Bethlehem, Pa.....	{ Assoc. M.	Mar.	3, 1897	
NEWBERRY, SPENCER BAIRD				
Gen. Mgr., Sandusky Portland Cement Co., Sandusky, Ohio....		Jan.	6, 1897	
NEWTON, RALPH EELLS				
Asst. Engr., Wisconsin Bridge & Iron Co.; Address, P. O. Box 1098, Milwaukee, Wis.....		Jan.	8, 1902	
NICHOLS, CHARLES HENRY				
Cons. Engr.; Engr. of Connecticut Shell Fish Comm.,	Jun.	May	2, 1893	
New Haven, Conn.....	{ Assoc. M.	May	2, 1900	
NOYES, HARRY LINCOLN				
Mech. Engr., Union Carbide Co., Niagara Falls, N. Y.....		June	5, 1901	
O'BRIEN, JOSEPH HENRY				
Asst. Engr. in Chg. of Bldg. Work, Union R. R. Co., and R. I. Sub. Ry. Co., Union Trust Co. Bldg. (Res., 26 Preston St.),				
Providence, R. I.....		May	1, 1901	
OESTREICH, HENRY LEWIS, Jr.				
Asst. Engr., Rapid Transit Comm., 13 Astor Pl.	Jun.	Oct.	4, 1892	
(Res., 2092 Bathgate Ave.), New York City.....	{ Assoc. M.	Dec.	6, 1899	

		Date of Membership.	
OGDEN, HENRY NEELY			
Asst. Prof. of Civ. Eng., Cornell Univ. (Res., 614 University Ave.), Ithaca, N. Y.	Jun. { Assoc. M.	Oct. 3, 1893 Oct. 5, 1898	
OLDS, CLARK	Erie, Pa.	Mar. 1, 1899	
OLNEY, ROBERT BLUM	American Pipe Mfg. Co., 112 North Broad St., Philadelphia, Pa.	Jun. { Assoc. M.	Jan. 3, 1895 Sept. 5, 1900
OSBORN, OLLIE STEELE	Locating Engr., Kansas City, Mexico & Orient Ry., Chihuahua, Mexico.	Oct. 2, 1901	
OSTRander, JOHN EDWIN	Prof. of Math. and Civ. Eng., Mass. Agricultural College, Amherst, Mass.	Jun. { Assoc. M.	May 2, 1888 Sept. 2, 1891
PAQUETTE, CHARLES ALFRED			
Supt., P. & E. Ry., Cor. Delaware and South Sts., Indianapolis, Ind.		April 6, 1898	
PERKINS, PHILo SACKETT	Asst. Engr., N. Y., N. H. & H. R. R., 59 Chester Ave., Providence, R. I.	Jun. { Assoc. M.	Mar. 5, 1890 April 3, 1895
PFEIFER, HERMAN JULIUS	First Asst. Engr., Terminal R. R. Assoc. of St. Louis, St. Louis Merchants Bridge Terminal Ry., 206 Union Station, St. Louis, Mo.	Sept. 6, 1899	
PHARR, HARRY NELSON	Chf. Engr., St. Francis Levee Board, 49 Southern Express Bldg., Memphis, Tenn.	Oct. 3, 1900	
PHILLIPS, FREDERICK CLINTON	584 Garden St., Little Falls, N. Y.	Jun. { Assoc. M.	June 4, 1895 April 4, 1900
PHILLIPS, HOWARD CRATHORNE	Asst. Supt., Chicago Div., A. T. & S. F. Ry., Ft. Madison, Iowa.	Jun. { Assoc. M.	April 5, 1892 Sept. 6, 1899
PITNEY, FREDERIC VERNON	Morristown, N. J.	Jun. { Assoc. M.	April 5, 1892 May 3, 1899
POLAND, WILLIAM BABCOCK	Div. Engr., B. & O. S. W. R. R., Washington, Ind.	Jun. { Assoc. M.	Oct. 31, 1893 May 3, 1899
POLLOCK, CLARENCE DuBOIS	Senior Asst. Engr., Sewer Div., N. Y. Rapid Transit R. R. Comm., 13 Astor Pl., New York City.	Jan. 8, 1902	
POPE, MACY STANTON	Insp. for Factory Mutual Fire Insurance Cos., 31 Milk St., Boston, Mass.	May 2, 1900	
PORTER, JAMES MADISON	Easton, Pa.	May 4, 1892	
POST, WILLIAM SCHUYLER	Supt., Ventura Water, Light & Power Co., Ventura, Cal.	May 1, 1901	
POTTER, ALEXANDER	Cons. Civ. Engr., 150 Nassau St., New York City.	Jun. { Assoc. M.	Jan. 4, 1888 Jan. 6, 1892

PRESSEY, HENRY ALBERT				
Hydrographer, U. S. Geological Survey; Prof. of Civ. Eng., Columbian Univ., Washington, D. C.....				May 1, 1901
PRESTON, HENRY WRAY				
Engr., Elmira and Athens Drawing Rooms, American Bridge Co., Elmira, N. Y.....				May 3, 1899
PRINCE, ARTHUR DICKSON				
Asst. Engr., Dept. of Highways, Bronx Borough (Res., 274 West 94th St.), New York City.....	Jun. Assoc. M.	May Oct.	5, 1896 3, 1900	
PRITCHARD, PHILIP MORRIS				
Care, Chf. Engr.'s Office, United Alkali Co., Ltd., Widnes, Lan- cashire, England				June 6, 1900
PRUYN, FRANCIS LANSING				
Asst. Engr., New East River Bridge, 84 Broadway, Brooklyn, N. Y.....	Jun. Assoc. M.	Dec. June	1, 1896 7, 1899	
PUTNAM, GEORGE ROCKWELL				
Asst., U. S. Coast and Geodetic Survey, P. O. Box 600, Manila, Philippine Islands.....				Feb. 1, 1899
QUICK, ALFRED MERRITT				
Pres. and Chf. Engr., Baltimore Water Board, City Hall, Balti- more, Md.....				Oct. 5, 1898
REICHMANN, ALBERT FERDINAND				
Asst. Engr., Western Div., American Bridge Co., 1318 Monadnock Bldg., Chicago, Ill.	Jun. Assoc. M.	April 30, 1895 Oct. 5, 1898		
REID, HOMER AUSTIN				
Asst. Engr., Rapid Transit R. R. Comm., New York City (Res., 169½ Columbia Heights, Brooklyn, N. Y.).....				Dec. 4, 1901
REYNOLDS, JUSTIN OAKLEY				
Asst. Engr., Rapid Transit R. R. Comm., 231 West 125th St., New York City.....	Jun. Assoc. M.	Oct. 6, 1896 Dec. 5, 1900		
RHODES, FRED DANA				
Asst. Engr., J. B. & J. M. Cornell, 26th St. and 11th Ave., New York City.....	Jun. Assoc. M.	June 6, 1899 Nov. 6, 1901		
RHYS-ROBERTS, EDMUND ALYTH				
Dominion Bridge Co., Ltd., Lachine Locks, Que., Canada				Nov. 3, 1897
RIPLEY, THERON MONROE				
Res. Engr., Ohio River Bridge & Ferry Co., Marietta, Ohio.....				Nov. 6, 1901
RITTENHOUSE, HARVEY				
Delta, Colo.....	Jun. Assoc. M.	April 4, 1893 Dec. 7, 1898		
ROBBINS, ALLAN APPLETON				
(Rapid Transit Subway Con. Co.), 1913 Amsterdam Ave., New York City				Oct. 2, 1901
ROBERTS, WILLIAM JACKSON				
Assoc. Prof. of Math. and Civ. Eng., Washington Agricultural College and School of Science, Pullman, Wash.....				June 6, 1900

		Date of Membership.
ROBINSON, HOLTON DUNCAN		
Chf. Draftsman, New East River Bridge, 84 Broadway, Brooklyn, N. Y. (Res., 357 West 121st St., New York City).....	{ Jun Assoc. M.	Mar. 1, 1893 Jan. 3, 1894
ROCKENBACH, SAMUEL DICKERSON		
Capt., 12th U. S. Cavalry, Engr. Officer, Santiago de Cuba, Cuba	Feb.	6, 1901
ROSENBERG, FRIEDRICH	{ Jun.	Oct. 2, 1889
520 Hudson St., Hoboken, N. J.....	{ Assoc. M.	Jan. 6, 1892
ROSENTHAL, ALBERT		
Supt., Mt. Vernon Dist., Westchester Lighting Co., 123 South 8th Ave., Mt. Vernon, N. Y.....	{ Jun. Assoc. M.	Jan. 2, 1894 Nov. 6, 1901
ROSEWATER, WILLIAM MARCUS		
Chf. Draftsman, The Bucyrus Co., South Milwaukee, Wis.....	June	5, 1901
ROSS, ELMER WAYLAND	{ Jun. Assoc. M.	Mar. 5, 1890 June 1, 1892
Asst. Engr., Bridge Dept., City Engr.'s Office, Providence, R. I.....		
ROUSSEAU, HARRY HARWOOD	{ Jun. Assoc. M.	June 6, 1893 April 4, 1900
Civ. Engr., U. S. N., Bureau of Yards and Docks, Navy Dept., Washington, D. C.....		
ROWELL, GEORGE FREEMAN	{ Jun. Assoc. M.	May 4, 1897 Jan. 2, 1901
Asst. Engr., Pennsylvania Water Co., 701 Wood St., Station D, Pittsburg, Pa.....		
ROY, ROBERT MAITLAND		
Asst. to Vice-Pres. and Mgr., The Hamilton Bridge Works Co., Ltd., Hamilton, Ont., Canada.....	Oct.	3, 1900
RUSSELL, RICHARD LORD	{ Jun. Assoc. M.	Feb. 5, 1895 April 3, 1901
Asst. Engr., M. of W., Brooklyn Heights R. R. Co., 168 Montague St., Brooklyn, N. Y.....		
RUST, HENRY BEDINGER		
Asst. Engr., Colorado Fuel & Iron Co.: Address, 918 South Union Ave., Pueblo, Colo.....	April	6, 1898
SABIN, ALVAH HORTON		
Box 85, Long Island City, N. Y.....	Mar.	4, 1896
SABIN, LOUIS CARLTON		
U. S. Asst. Engr., Federal Bldg., Port Huron, Mich	Oct.	4, 1893
SANFORD, HARRY CHARLES		
Engr., The Degnon-McLean Contracting Co., 42d St. and 6th Ave., New York City.	Oct.	5, 1898
SARGENT, JOSEPH ANDREWS		
Asst. Engr. in Clig. of Survey, Dept. of Cuba, Havana, Cuba...	Oct.	2, 1901
SCARBOROUGH, FRANCIS WINTHROP		
Engr., M. of W., Chesapeake & Ohio Ry., Richmond, Va.	{ Jun. Assoc. M.	Sept. 3, 1890 Mar. 6, 1895
SCHARSCHMIDT, SAMUEL HOWARD		
Asst. Engr., Northern Ry., Limon, Costa Rica.....	May	1, 1901
SCHMITT, EWALD		
2235 Thirteenth St., N. W., Washington, D. C.....	Feb.	7, 1900

SCHMITZ, FRANK CURTISS				
Gen. Mgr., The Fireproofine Mfg. Co., 66 Beaver St., New York City.....		Dec.	6, 1899	
SCHNEIDER, ANTON				
968 East 166th St., New York City.....		May	4, 1898	
SCOFIELD, EDSON MASON				
Pres. and Mgr., National Bridge Co. of Penna., Pittsburg, Pa..		April	1, 1896	
SCRIPTURE, ARTHUR MARQUIS				
New Hartford, N. Y.....		June	3, 1896	
SEARS, ROBERT HUMPHREY				
Care, Chf. Engr., East Indian Ry. Office, Calcutta, India.....		Dec.	4, 1901	
SELTZER, HARRY KENT				
Res. Engr., Alexandria Bridge (for Waddell & Hedrick, Cons. Engrs. to the S. & R. R. V. Ry.) Lock Box 502, Alexandria, La.....	{ Jun. Assoc. M.	Feb. Jan.	4, 1896 2, 1901	
SEUROT, PAUL ALBERT		Jun.	April 30, 1895	
University Pl., Ozone Park, N. Y.....	{ Assoc. M.	Oct.	4, 1899	
SHANAHAN, JOHN NEWTON		Jun.	Oct. 4, 1898	
Pres., Mohawk Valley Const. Co., Gloversville, N. Y. { Assoc. M.	Assoc. M.	Mar.	6, 1901	
SHAW, ENOS LARKIN		Jun.	Oct. 3, 1893	
2691 N. Hermitage Ave., Chicago, Ill.....	{ Assoc. M.	June	1, 1898	
SHELLENBERGER, LEIDY RUDY				
215 Righter St., Wissahickon, Philadelphia, Pa.....		May	2, 1900	
SHEPARD, HENRY HUDSON				
Supt., B. & P. Div., D., L. & W. R. R., Bangor, Pa.....		May	2, 1900	
SHERMAN, CHARLES WINSLOW				
Asst. Engr., Sudbury Dept., Met. Water-Works, 1 Ashburton Pl., Boston, Mass.....	{ Jun. Assoc. M.	Oct. May	8, 1891 2, 1900	
SHOEMAKER, LOUIS HENRY				
Eng. Dept., American Bridge Co., 51st and Butler Sts., Pittsburgh, Pa ..		Oct.	4, 1899	
SIMPSON, GEORGE				
Asst. Engr., Thompson-Starrett Co., 51 Wall St., New York City.		April	4, 1900	
SIRRINE, JOSEPH EMORY		Jun.	June 20, 1893	
Box 98, Greenville, S. C.....	{ Assoc. M.	May	4, 1898	
SMITH, ALBERT				
Saltsburg, Pa.....		Jan.	6, 1892	
SMITH, CHARLES WILLIAM				
31 Broadway, New York City.....		April	5, 1893	
SMITH, LEONARD SEWALL				
Asst. Prof. of Topographic and Geodetic Eng., Univ. of Wisconsin, 939 University Ave., Madison, Wis.....		June	2, 1897	
SMITH, PEMBERTON				
Cons. Engr., New York Car Wheel Works, Buffalo, N. Y ..	{ Jun. Assoc. M.	Mar. April	31, 1891 4, 1894	
SMITH, WALTER MICKLE				
U. S. Engr. Office, Portland, Me.....		Oct.	2, 1901	
SMITH, WILLIAM STUART				
59 West Main St., Rochester, N. Y.....		Jan.	8, 1902	

		Date of Membership.
SMITH, WILSON FITCH		
Asst. Engr., Rapid Transit R. R. Comm. (Res., 36 West 36th St.), New York City.....	Jun. Assoc. M.	Jan. 3, 1895 May 1, 1901
SNOW, FRANK HERBERT		
(Snow & Barbour, Civ. and San. Engrs.), Tremont Bldg., Boston, Mass.....		June 4, 1895
SOPER, GEORGE ALBERT		
San. Engr., 29 Broadway, New York City.....		Feb. 6, 1901
SPENCER, JOHN CLARK		
Structural Eng. Dept., American Bridge Co., 7 West 22d St., New York City.....		May 6, 1896
SPENCER, THEODORE NELSON		
Second Asst. Engr., Torresdale Conduit Impvt., Extension and Filtration of the Water Supply of Philadelphia, 1821 Mt. Vernon St., Philadelphia, Pa.....		Sept. 5, 1900
SPENCER, WALTER TUTTLE		
Div. Engr., N. Y., N. H. & H. R. R., New Haven, Conn.....	Jun. Assoc. M.	May 2, 1893 Oct 4, 1899
SPIELMAN, JOHN GODFREY		
Chf. Engr., Brown-Ketcham Iron Works, Indian- apolis, Ind.....	Jun. Assoc. M.	Mar. 4, 1891 May 1, 1895
STEARNS, EDWARD BURNHAM		
Contr. Engr., American Bridge Co., Chamber of Commerce Bldg., Cleveland, Ohio		June 1, 1898
STEECE, ENMET ABNER		
City Engr., Burlington, Iowa.....		Dec. 4, 1901
STENGER, ERNEST		
Room 210, Tabor Blk., Denver, Colo.....		June 5, 1895
STEVENS, ALEXANDER		
Buildings Supt., New York Fire Dept., 157 East 67th St., New York City.....		April 1, 1896
STEWARD, SPENCER JAMES		
381 Central Park West, New York City.....		June 7, 1899
STEWART, CLINTON BROWN		
Anchor, Ill.....		Oct. 5, 1898
STICKNEY, GEORGE FETTER		
Asst. Engr., Lake Superior Power Co., Sault Ste. Marie, Mich.....	Jun. Assoc. M.	May 1, 1894 April 5, 1899
STIDHAM, HARRISON		
American Bridge Co., 7 West 22d St., New York City.....		April 4, 1900
STOCKETT, ALFRED WALTON		
Ookiep, Namaqualand, Cape Colony, South Africa.....		Jan. 1, 1896
STORROW, SAMUEL		
Civ. and Min. Engr., 402 Douglas Bldg., Los An- geles, Cal	Jun. Assoc. M.	Sept. 10, 1891 Oct. 2, 1895
STOWE, HAROLD CLAIR		
(Clarke, Wright & Stowe, Contr. Engrs.), St. James Bldg., 1135 Broadway, New York City.....		April 7, 1897

Date of
Membership.

STRAHAN, CHARLES MORTON			
Prof. of Civ. Eng., Univ. of Georgia, Athens, Ga.....		June 1, 1898	
STRATTON, GEORGE DRAPER			
Asst. Engr., Western Div., Southern Pacific R. R., 930 Filbert St., Oakland, Cal.....		Oct. 4, 1899	
STRATTON, GEORGE EBER			
U. S. Hydrographer, Room 1014, Barristers Hall, Boston, Mass.		Jan. 8, 1902	
STREHLLOW, OSCAR EMIL			
U. S. Insp., Lock and Dam No. 6, Warrior River, Ala., Tusca- loosa, Ala.....		Mar. 6, 1901	
STRICKLER, GRATZ BROWN			
Supt. of Constr., U. S. Public Bldgs., Clinton, Iowa. { Assoc. M.		Jan. 5, 1897	
STRONG, WILLIAM EDWARD SCHENCK			
Vice-Chairman of Operating Board, American Radiator Co., Chicago, Ill.....		May 4, 1898	
STUART, JAMES LYALL			
Care, James Stewart & Co., 1405 Park Bldg., Pitts- { Jun. burgh, Pa.....		Oct. 4, 1898	
		Assoc. M. { Feb. 7, 1900	
SWAAB, SOLOMON MARK			
Asst. Engr., Impvt., Extension and Filtration, { Jun. Water Supply, Philadelphia, Pa.....		May 3, 1898	
		Assoc. M. { Nov. 1, 1899	
SWEITZER, NELSON BOWMAN			
U. S. Examiner of Surveys, Surveying Div., Gen. { Jun. Land Office, Washington, D. C.....		Feb. 28, 1893	
		Assoc. M. { Mar. 1, 1899	
SYKES, GEORGE WHITFIELD			
Div. Engr., Pittsburg, Bessemer & Lake Erie R. R., { Jun. Mercer, Pa.....		April 30, 1895	
		Assoc. M. { Dec. 1, 1897	
TABER, GEORGE AYMAR			
Asst. Engr., Rapid Transit R. R. Comm., 231 West { Jun. 125th St., New York City.....		April 30, 1895	
		Assoc. M. { June 7, 1899	
TAINTER, FRANK STONE			
Far Hills, N. J.; Office, 18 East 60th St., New York City.....		Jan. 3, 1900	
TAIT, JOHN GEORGE			
Engr. and Contr., 31 West 125th St., New York City.....		May 6, 1896	
TAYLOR, CHARLES FREDERICK			
Treas., Boston Tunnel Const. Co., 23 Lewis St., East Boston, Mass.....		Sept. 4, 1895	
THEBAN, JOHN GERARD			
Engr. in Chg. of Dept. of Bridges, Borough of the Bronx, Third Ave. and 177th St., New York City.....		Mar. 3, 1897	
THOMAS, SAMUEL RICHARDS			
Engr. and M. M., Ironton R. R., Hokendauqua, Pa. { Assoc. M.		Oct. 4, 1892	
		Mar. 1, 1899	
THOMES, EDWIN HOWARD			
Asst. Engr., Rapid Transit Comm., 1st Div., 13 Astor Pl., New York City (Res., 4 Park Ave., Jamaica, N. Y.).....		Dec. 6, 1899	
THOMPSON, CLARK WALLACE			
Orchard Pl., La Crosse, Wis. { Jun. { Assoc. M.		Mar. 5, 1890	
		July 3, 1895	

		Date of Membership.
THOMPSON, ROBERT ANDREW	{ Jun.	April 6, 1897
Engr., Railroad Comm. of Texas, Austin, Tex.....	Assoc. M.	Oct. 4, 1899
THOMPSON, SANFORD ELEAZER		
Newton Highlands, Mass.....		April 1, 1896
THOMSON, ERNEST BURSLEM		
U. S. Supt., St. Augustine, Fla.....		June 5, 1901
THORNLEY, JULIAN		
Asst. Engr., N. Y. Rapid Transit R. R. Comm., 231 West 125th St., New York City.....		Jan. 2, 1901
THROOP, AUGUSTUS THOMPSON		
Secy., Dobbie Foundry & Machine Co., Niagara Falls, N. Y.....	{ Jun. Assoc. M.	Oct. 3, 1893 Mar. 3, 1897
TIGHE, JAMES LAWRENCE		
City Engr., Holyoke, Mass.....		Oct. 5, 1898
TILDEN, CHARLES JOSEPH		
Asst. Engr., N. Y. Rapid Transit R. R. Comm., 1161 Amsterdam Ave., New York City.....	{ Jun. Assoc. M.	May 31, 1898 Feb. 5, 1902
TODD, ALEXANDER MILLER		
U. S. Supt. of Constr., P. O. Box 167, Greenville, Miss.....	{ Jun. Assoc. M.	Oct. 1, 1895 Oct. 2, 1901
TOLTZ, MAX		
Mech. Engr., Great Northern Ry., St. Paul, Minn.....		Sept. 7, 1892
TONKIN THOMAS, JUAN		
Hydr. Engr., Care, Flint, Eddy & American Trading Co., 30 Broad St., New York City.....		Mar. 7, 1900
TOWER, JAMES WALLACE		
Prin. Asst Engr., Great Northern Paper Co., Millinocket, Me..		Oct. 2, 1901
TOWLE, CHARLES STEWART		
220 Broadway, New York City.....		May 3, 1899
TOWSON, MORRIS SHERMAN		
16 Bolton Ave., Cleveland, Ohio		Nov. 1, 1893
N. TRATMAN, EDWARD ERNEST RUSSELL	{ Jun.	April 7, 1886
1636 Monadnock Blk., Chicago, Ill.....	Assoc. M.	July 1, 1891
TRIPP, OSCAR HOLMES		
Room 30, Court House, Rockland, Me.....		Oct. 7, 1896
TROUT, CHARLES ELIPHALET		
Dept. of Docks and Ferries, Pier A, North River, New York City	{ Jun. Assoc. M.	Oct. 31, 1899 Jan. 8, 1902
TSUJI, TARO		
Engr., Govt. Ry. Office, 24 Hongo Umicho Nichome, Tokyo, Japan.....	{ Jun. Assoc. M.	Oct. 8, 1891 Oct. 4, 1899
TUCKER, WILLIAM CONQUEST	{ Jun.	May 5, 1891
Civ. and San. Engr., 156 Fifth Ave., New York City.	Assoc. M.	Dec. 5, 1894
TURNER, DANIEL LAWRENCE		
50 West 51st St., New York City.....		Feb. 2, 1898
TURNER, GEORGE DALLAS BAIRD		
Mgr., Red Bluff Gold Mining Co., Red Bluff, Mont....		Nov. 2, 1898

ULRICH, DANIEL			
Div. Engr., Aqueduct Commrs., Jerome Park Reservoir, New York City.....		Sept. 1, 1897	
UPHAM, RICHARD DANA	{ Assoc.	Oct. 6, 1896	
11 Broadway, New York City.....	{ Assoc. M.	April 3, 1901	
URQUHART, GEORGE COPELAND			
Asst. Real Estate Agt., P., C., C. & St. L. Ry. Co., 1003 Penn Ave., Pittsburgh, Pa.....		May 6, 1891	
VAIL, CHARLES DAVIS			
12 Bee Hive Bldg., Butte, Mont.....		June 6, 1900	
VAN ALSTYNE, HENRY ARTHUR			
Div. Engr., New York State, State Hall, Albany, N. Y.....		June 6, 1900	
VAN BUSKIRK, CLARENCE RANDALL			
108 Van Sicklen St., Brooklyn, N. Y.		Feb. 3, 1897	
VAN CLEVE, AARON HOWELL	{ Jun.	May 31, 1892	
Asst Engr., Niagara Falls Power Co. (Res., 5 West C St.), Niagara Falls, N. Y.....	{ Assoc. M.	Dec. 5, 1894	
VAN ETEN, LAWRENCE EDWARD			
New Rochelle, Westchester Co., N. Y.		Dec. 6, 1899	
VEDELER, GERDT HENRIK			
Afdelingsingeniör, Den tekniske Revision, Dept. for offentlige Arbeider, Victoria Terrasse 7, Christiania, Norway.....		June 7, 1893	
VENABLE, WILLIAM MAYO			
Local Mgr., The National Contracting Co., 713 Hennen Bldg., New Orleans, La.....		Sept. 4, 1901	
VICKERS, THOMAS MCELDERRY			
Supt., Empire Mills, Auburn, N. Y.; Address, 504 McBride St., Syracuse, N. Y.		Mar. 2, 1898	
VIER, HENRY			
Engr. of Resurveys, N. Y. C. & H. R. R. R., Room 400, Grand Central Station, New York City.....		Feb. 7, 1900	
VILLALON, JOSÉ RAMON	{ Jun.	July 4, 1888	
Secy. of Public Works, Havana, Cuba.....	{ Assoc. M.	Nov. 6, 1895	
VOGLESON, JOHN ALBERT			
Third Asst. Engr., Impvt., Extension and Filtration of the Water Supply, 1700 Green St., Philadelphia, Pa.....		Jan. 2, 1901	
VOORHEES, PAUL			
1203 Delaware Ave., Buffalo, N. Y.		Feb. 3, 1892	
VREDENBURGH, WATSON, Jr.			
32 Broadway, New York City.		Mar. 6, 1901	
WADA, YOSHICHIKA	{ Jun.	Sept. 7, 1887	
Doboku-kwantoku-cho, Niigata, Japan.....	{ Assoc. M.	Oct. 2, 1895	
WADSWORTH, JOEL EDWARD	{ Jun.	Dec. 5, 1893	
Asst. Div. Engr., American Bridge Co., 7 West 22d St., New York City.....	{ Assoc. M.	May 5, 1897	

Date of
Membership.

WAGNER, BERNARD MATTHEW				
Asst. Engr., Dept. of Water Supply, New York City; 257 East 12th St., Flatbush, Brooklyn, N. Y.....			May	3, 1899
WAGNER, JOSEPH CHRISTIAN				
Surv. and Regulator, 9th Survey Dist., Dept. of Public Works, Philadelphia; Office, Chelton Ave. and Greene St., German- town (Res., 1539 North 12th St.), Philadelphia, Pa.....		June	7, 1899	
WAITE, GUY BENNETT				
Civ. Engr. and Contr., 624 East 19th St., New York City.....		May	2, 1894	
WAITT, CHARLES GREENE	{ Jun.	Aug.	31, 1897	
Waitt's Blk., Malden, Mass.....	{ Assoc. M.	Oct.	5, 1898	
WALKER, CLEMENT ISAAC				
Chf. Engr., Union Subway Construction Co., 113 West 38th St., New York City.....		April	1, 1891	
WALKER, JOSEPH MILTON				
Supt., New Castle Traction Co., New Castle, Pa.....		April	3, 1901	
WALLACE, WILLIAM McGEHEE				
In Chg. Scientific and Computing Branch, Bureau of Constr. and Repair, Navy Dept. (Res., 616 Eighteenth St., N. W.), Washington, D. C.....	{ Jun. Assoc. M.	April Nov.	3, 1894 6, 1901	
WALSH, GEORGE SCHERZER	{ Jun.	Feb.	2, 1897	
Res. Engr., Salvador Ry. Co., Ltd., San Salvador, Salvador.....	{ Assoc. M.	May	1, 1901	
WALTHER, EDWARD				
Archt., Civ. and Mech. Engr., "The Drewsen Co.", Temple Court Bldg., New York City.....		May	1, 1895	
WARMAN, FRED CONOVER				
U. S. Asst. Engr., 2001 I St., N. W., Washington, D. C.....		Jan.	3, 1900	
WARRINGTON, HARRY ESMOND				
Asst. Engr., C., N. O. & T. P. Ry. Co., 205 Odd Fellows' Temple, Cincinnati, Ohio.....		April	6, 1898	
WASHINGTON, WILLIAM DE HERTBURNE				
Pres. and Chf. Engr., Hydraulic Constr. Co., 1 Broadway, New York City.....		Oct.	5, 1892	
WASON, LEONARD CHASE				
Pres. and Engr., Aberthaw Construction Co., 7 Exchange Pl., Boston, Mass.....		April	3, 1901	
WATSON, WALTER				
Salem, Va		April	5, 1893	
WATSON, WILBUR JAY				
Bridge Engr., The Osborn Engineering Co., Cleve- land, Ohio.....	{ Jun. Assoc. M.	Oct. Jan.	4, 1898 2, 1901	
WEBB, WALTER LORING				
1202 Harrison Bldg., Philadelphia, Pa.....		May	4, 1892	
WEBSTER, ALBERT LOWRY				
Cons. Civ. and San. Engr., 3 Broad St., New York City.....	{ Jun. Assoc. M.	Sept. June	6, 1882 3, 1891	
WESTON, ROBERT SPURR				
14 Beacon St., Boston, Mass.....		Feb.	5, 1902	

WEYMOUTH, FRANK ELWIN				
Res. Engr., Guayaquil & Quito Ry. Co., Guayaquil, Ecuador.		Sept.	4, 1901	
WHEATLEY, ARTHUR C. CORNWALLIS				
Chf. Engr. to Dr. Salvador Malo, Concepcion del Oro, Zacatecas, Mexico (<i>via</i> Laredo).....	{ Jun. Assoc. M.	May Mar.	7, 1890 6, 1895	
WHEELER, HARRY ROBERTS				
1 Broadway, New York City.....	{ Jun. Assoc. M.	April May	4, 1888 4, 1892	
WHEELOCK, DE FOREST AUGUSTUS				
City Engr., 109 East St., Warren, Pa.....		Feb.	3, 1897	
WHIPPLE, GEORGE CHANDLER				
Biologist, and Director of Mt. Prospect Laboratory, Brooklyn Water Dept., Flatbush Ave. and Eastern Parkway, Brooklyn, N. Y.		Sept.	6, 1899	
WHISKEMAN, JAMES PETER				
Asst. Engr., Office of the Chf. Engr., L. & N. R. R., Louisville, Ky.	{ Jun. Assoc. M.	Jan. Nov.	31, 1899 7, 1900	
WHISTLER, JOHN T				
New Antioch, Ohio.....		Jan.	2, 1901	
WHITE, WILLIAM MACINTIRE				
Engr., American Bridge Co., Wissahickon, Philadelphia, Pa....		Jan.	2, 1901	
WHITED, WILLIS				
Asst. Engr., Dept. Public Works, Pittsburgh, Pa.; Address, 286 Main St., Sta. B, Pittsburgh, Pa.		Oct.	2, 1901	
WHITTEMORE, WALTER FRANK				
1 Newark St., Hoboken, N. J.	{ Jun. Assoc. M.	Mar. April	6, 1889 6, 1892	
WIGGINS, WILLIAM D				
Engr., M. of W., Marietta Div., Pennsylvania Co., Cambridge, Ohio		Oct.	2, 1901	
WILCOX, FRED ELMER				
956 Orange Grove Ave., Pasadena, Cal.....		April	1, 1896	
WILKERSON, THOMAS JEFFERSON				
Asst. to Mgr., Pittsburg Div., American Bridge Co., 51st St., Pittsburg, Pa.	{ Jun. Assoc. M.	April Jan.	3, 1894 5, 1898	
WILKES, JAMES KNAPP				
Engr. for the Hoffman Engineering & Contracting Co., Annapolis, Md.		June	3, 1891	
WILKINS, GEORGE SHREVE				
Prof. of Eng., Univ. of Alabama, University P. O., Ala.	{ Jun. Assoc. M.	Oct. Oct.	4, 1892 5, 1898	
WILLIAMS, CHARLES PAGE				
Res. Engr. of Fortifications, Ft. Williams, Portland, Me.....		Oct.	2, 1901	
WILLIAMS, CHAUNCEY GRANT				
117 Montague St., Brooklyn, N. Y.		Feb.	6, 1895	
WILSON, CHARLES WILLIAM SCHRAGE				
Engr., Naughton & Co., Contrs., 258 Broadway, New York City (Res., New Rochelle, N. Y.)....	{ Jun. Assoc. M.	April Jan.	5, 1892 3, 1900	
WILSON, PERCY HARTSHORNE				
Engr., Secy. and Treas., River & Harbor Improvement Co., 801 Drexel Bldg., Philadelphia, Pa....	{ Jun. Assoc. M.	Jan. Feb.	2, 1900 5, 1902	

		Date of Membership.
WILSON, THOMAS WILLIAM		
Prin. Asst. Engr., International Traction Co., Buffalo, N. Y..	April	4, 1900
WINFREE, PEYTON BROWN	{ Jun.	Oct. 2, 1894
Asst. Engr., Water-Works Constr., Du Bois, Pa.....	{ Assoc. M.	May 3, 1898
WING, CHARLES BENJAMIN		
Prof. of Structural Eng., Stanford Univ., Cal.....	Nov.	4, 1896
WING, FREDERICK KELLY	{ Jun.	May 31, 1892
111 White Bldg., Buffalo, N. Y.....	{ Assoc. M.	Nov. 1, 1899
WINN, WALTER SCOTT		
U. S. Asst. Engr., Kingman, Ala.....	Oct.	6, 1897
WOERMANN, JOHN WILLIAM		
Res. Engr., Ill. & Miss. Canal, Sheffield, Ill.....	May	1, 1895
WOLVERTON, IRVING MASON		
Chf. Engr., The Mt. Vernon Bridge Co., Mt. Vernon, Ohio....	Dec.	4, 1895
WOOD, IRVING SPARROW		
Asst. Engr., in Chg. of Water Dept., City Engr.'s Office, Providence, R. I.....	{ Jun. Assoc. M.	Mar. 5, 1890 Mar. 7, 1900
WOODARD, SILAS		
20 West 34th St., Room 43, New York City.....	Jan.	2, 1901
C. WOODS, ROBERT PATTERSON		
Civ. Engr., Townsend, Reed & Co., Railway Builders, 1208 Stevenson Bldg., Indianapolis, Ind.....	{ Jun. Assoc. M.	Feb. 2, 1897 Mar. 7, 1900
WORTENDYKE, NICHOLAS DOREMUS		
Asst. Chf. Engr., Street and Water Board (Res., 108 Bentley Ave.), Jersey City, N. J	Feb.	1, 1899
WRIGHT, JOSEPH BODINE		
(Clarke, Wright & Stowe, Contr. Engrs.), 1135 Broadway, New York City.....	June	2, 1897
YEREANCE, WILLIAM BURNET		
418 Center St., South Orange, N. J	{ Jun. Assoc. M.	May 3, 1892 Dec. 2, 1896
ZARBELL, ELMER		
Res. Engr., L. & N. R. R. Co., Selma, Ala.....	{ Jun. Assoc. M.	Jan. 3, 1899 Feb. 7, 1900
ZELLER, ALBERT HENRY		
1000 Fullerton Bldg., St. Louis, Mo.....	{ Jun. Assoc. M.	May 7, 1890 April 7, 1897

Associate Members, 629.

ASSOCIATES.

[Assoc. Am. Soc. C. E.]

		Date of Membership.
ABBOTT, EDWARD LORENZO		Jun.
1826 Fifteenth St., N. W., Washington, D. C.....	{ Assoc.	Sept. 1, 1886
ABBOTT, WILLIAM LATHAM		April 30, 1895
541 Wood St., Pittsburg, Pa.....		May 1, 1889
ACKERMAN, ERNEST ROBINSON		May 1, 1900
1 Broadway, New York City.....		May 1, 1900
AUCHINCLOSS, JOHN WINTHROP		April 2, 1901
22 William St., New York City.....		April 2, 1901
BARNES, WILLIAM HENRY		
Pres., Allegheny Valley Ry. Co. and Western New York and Pennsylvania Ry. Co., 256 Gen. Office, Pennsylvania R. R. Co., Philadelphia, Pa.....		Sept. 2, 1885
BELDEN, EDGAR TWEEDY		
Lawn Ave., Middletown, Conn.....		Mar. 5, 1901
BENNETT, LESLIE J		
Secy., Buffalo Cement Co., Ltd., 110 Franklin St., Buffalo, N.Y.		Jan. 7, 1902
BERTHELET, JOSEPH R		
Mgr., Milwaukee Cement Co., Milwaukee, Wis.....		Nov. 1, 1898
BOGART, SAMUEL STOCKTON		
Real Estate, 489 Fifth Ave., New York City (Res., Dumont, N. J.)		April 7, 1886
BOOTH, WILLIAM FERRIS		
Cons. Engr., Transit Contract Co., 519 Connell Bldg., Scranton, Pa.....	{ Jun. Assoc.	Jan. 7, 1885 April 30, 1895
BRADLEY, CHARLES WHITING		
Mgr., Western N. Y. Car Service Assoc., 1064 Ellicott Sq., Buf- falo, N. Y.....		June 19, 1891
BRAINE, LAWRENCE FULTON		
Gen. Mgr., Continuous Rail Joint Co. of America, Newark, N.J.		Sept. 6, 1898
BROWN, THANE ROSS		
With Wisconsin Bridge & Iron Co., North Milwaukee, Wis.....	{ Jun. Assoc.	Mar. 31, 1896 Oct. 2, 1900
BURNHAM, GEORGE, Jr.		
(Burnham, Williams & Co.), Baldwin Locomotive Works, Philadelphia, Pa.....	{ Jun. Assoc.	Jan. 6, 1875 July 2, 1890
BURROWS, GEORGE LORD		
Saginaw, Mich		Feb. 3, 1886
CHAPMAN, MELVILLE DOUGLAS		
Pres., Alleghany Iron & Steel Co. and Chapman Coal & Coke Co., 80 Broadway, New York City		Sept. 1, 1896

CHURCH, IRVING PORTER		
Prof. of Applied Mechanics and Hydraulics, Cornell Univ., Ithaca, N. Y.....	Oct. 1, 1901	
CLARK, LUDLOW VICTOR, Jr.		
619 Harrison Bldg., Philadelphia, Pa.....	Oct. 4, 1892	
COLSTEN, ALBERT LLOYD		
Master of Applied Mathematics, Tome Inst., Port Deposit, Md.	Sept. 3, 1901	
COMFORT, SILAS GILDERSLEEVE		
Vice Pres. and Prof. of Eng., Pennsylvania Military College, Chester, Pa.....	Mar. 31, 1891	
COMPTON, ALFRED G		
Prof. of Physics, The College of the City of New York, 17 Lexington Ave. (Res., 40 West 126th St.), New York City.....	Sept. 5, 1877	
CRAFTS, GEORGE HENRY		
Civ. Engr. and Bridge Contr., 164 Forest Ave., Atlanta, Ga.....	April 4, 1888	
CURRIER, CHARLES GILMAN		
313 West 102d St., New York City.....	June 21, 1894	
DAVIS, JOHN WOODBRIDGE		
Tranquil House, Manteo, Dare Co., N. C.....	June 3, 1885	
DEWEY, CHARLES ELLIS		
28 Flower Bldg., Watertown, N. Y.....	Nov. 5, 1901	
DIVEN, JOHN M.		
Supt., Water-Works, Elmira, N. Y.	Sept. 10, 1891	
DOUGLASS, ANTHONY CHILEON		
Gen. Contr., Niagara Falls, N. Y.....	April 30, 1895	
DRUMMOND, THOMAS JOSEPH		
(Drummond, McCall & Co.), Montreal, Que., Canada.....	Mar. 6, 1894	
DUBARRY, EDMUND LOUIS		
Supt., Terminals, N. & W. Ry., Norfolk, Va.....	Jan. 6, 1875	
ECKEL, EDWIN CLARENCE		
Asst. in Geology, State Museum, Albany, N. Y.....	Mar. 5, 1901	
ELLIOTT, HOWARD		
Gen. Mgr., Burlington Route, 604 Pine St., St. Louis, Mo.....	June 5, 1900	
FARRELL, EDWARD JAMES		
355 West 145th St., New York City.....	June 6, 1899	
FISHBURNE, EDWARD BELL, Jr.		
Pres., Hoge Memorial Military Academy, Blackstone, Va.....	Dec. 5, 1899	
FISK, WILBUR CHAPMAN		
24 Nassau St., New York City.....	Oct. 4, 1892	
FLETCHER, ROBERT		
Director, Thayer School of Civ. Engr., Dartmouth College, Hanover, N. H.	Nov. 4, 1874	
FOSTER, CLARENCE MARVIN		
920 Chamber of Commerce Bldg., Chicago, Ill.....	Jan. 31, 1899	
FREEMAN, FRANK LESLIE		
931 F St., Washington, D. C.	Nov. 5, 1895	

FROST, GEORGE HENRY			
220 Broadway, New York City.....		Jan.	4, 1882
FUTAMI, KYOSABURO			
Prof. of Civ. Eng., Kyoto Imperial Univ., Kyoto, Japan.....		June	5, 1889
GIBSON, WILLIAM, JR.			
122 Fenimore St., Brooklyn, N. Y.....		Sept.	5, 1888
GILDERSLEEVE, ALGER CROCHERON			
Civ. Engr. and Contr., 215 West 125th St., New York City...	Jun. Assoc.	Feb. April	6, 1894 4, 1899
GOLDSBOROUGH, JOHN BYRON			
Supt. Constr., New Croton Dam, Croton-on-Hudson, N. Y.....		April	4, 1899
GOODELL, JOHN MILTON			
34 May St., Worcester, Mass.....		July	29, 1891
GOODMAN, EDWARD HARRIS			
Vice-Pres. and Gen. Mgr., The Union Switch & Signal Co., Swiss- vale, Pa.....		June	4, 1891
GRAHAM, WILLIAM WOODMAN			
Care, Messrs. Stahlknecht, Durango, Mexico.....		Dec.	6, 1898
GRiffin, PATRICK HENRY			
Pres., New York Car Wheel Works, Buffalo, N. Y.....		Oct.	1, 1890
HAMLIN, CHARLES EDWARD			
Contr. Mgr., American Bridge Co. in the southern states; Ad- dress, 502 English-American Bldg., Atlanta, Ga.....		Jan.	2, 1894
HARDWICKE, ALAN HYDE GARDNER			
Niagara Falls, N. Y.....		June	4, 1884
HARRIS, CHARLES MARSHALL			
58 William St., New York City.		Jan.	8, 1873
HARRISON, LOUIS BALDWIN			
Fifth Ave. Hotel, Troy, N. Y.....		May	5, 1896
HARTRANFT, WILLIAM GARRIGUES			
Pres., Wm. G. Hartranft Cement Co., Real Estate Trust Bldg., Broad and Chestnut Sts., Philadelphia, Pa.....		May	3, 1898
HAZEN, JOHN VOSE			
Prof. of Civ. Eng. and Graphics, Dartmouth College, Hanover, N. H.....		June	5, 1889
HUNSIKER, MILLARD			
4 Park St., Park Lane, London, W., England.....		June	5, 1889
HUSTON, JAMES ARCHIBALD			
Gen. Mgr., Contr. Dept., American Bridge Co., Empire Bldg., Pittsburg, Pa.....		Aug.	31, 1897
JACOBY, HENRY SYLVESTER			
Prof. of Bridge Eng., Cornell Univ., 7 Reservoir Ave., Ithaca, N. Y.....		Nov.	5, 1890
JOHNSTON, JOHN PARRY			
822 Marquette Bldg., Chicago, Ill.....		April	3, 1894

	Date of Membership.
KARNER, WILLIAM JOSIAH Chf. Engr.'s Office, Ill. Cent. R. R. Co., Chicago, Ill.....	June 2, 1890
KELLEY, JAMES AUGUSTUS Res. Engr. in Chg. of Constr., P. & R. Ry., Room 516, Reading Terminal, Philadelphia, Pa.....	Mar. 5, 1901
KING, HARRY WHEELOCK Vice-Pres., The King Bridge Co., Cleveland, Ohio.....	June 19, 1891
KING, WALLACE, JR. Vice-Pres., United Building Material Co., 13 Park Row, New York City	Dec. 4, 1900
KNOWLTON, THEODORE ELY Care, St. Regis Paper Co., Watertown, N. Y.....	Mar. 31, 1896
LAFLARGE, OLIVER HAZARD PERRY (Bond & La Farge), Second Ave. and Cherry St., Seattle, Wash.	April 5, 1898
LESLEY, ROBERT WHITMAN Pres., American Cement Co., 22 South 15th St., Philadelphia, Pa.	Jan. 31, 1893
LINDENBERGER, CASSIUS HOWARD 29 Adelaide St., Detroit, Mich.....	Feb. 2, 1892
LIVINGSTON, JULIUS I. Bound Brook, N. J.....	July 3, 1889
MCKENNA, CHARLES FRANCIS Chemist, 221 Pearl St., New York City.....	June 5, 1894
McKINNEY, ROBERT COCHRAN Pres., Niles Bement Pond Co., Platt & Whitney Co., 136 Liberty St., New York City.....	Oct. 6, 1886
MAIGNEN, JEAN PROSPER AUGUSTE 1310 Arch St., Philadelphia, Pa.....	Oct. 3, 1899
MEYER, HENRY CODDINGTON, Jr. Editorial Staff, <i>The Engineering Record</i> , 100 William St., New York City.....	Jun. 3, 1893 Assoc. Dec. 28, 1900
MILNE, PETER Room 719, Bennett Bldg., New York City.....	Jan. 7, 1896
MONKS, JOHN, Jr. 130 Water St. (Res., 139 West 121st St.), New York City.....	May 31, 1898
MOXHAM, ARTHUR JAMES Vice-Pres. and Gen. Mgr., Dominion Iron & Steel Co., Ltd., Sydney, Cape Breton, N. S., Canada.....	Nov. 2, 1887
NORTON, HENRY LORD (Collins & Norton, Engrs. and Contrs.), 33 Lyman St., Springfield, Mass.....	May 4, 1897
OASTLER, WILLIAM CHURCHILL 156 Fifth Ave., New York City.....	Mar. 31, 1891
ODELL, RUTLEDGE IRVING Tomkins Cove, N. Y.....	Oct. 1, 1895

PACKARD, RALPH GOODING, Jr.			
Vice-Pres., R. G. Packard Co., 130 Pearl St., New York City...	Sept.	3, 1901	
PALMER, WILLIAM PENDLETON			
Gen. Mgr., American Steel & Wire Co., Western Reserve Bldg., Cleveland, Ohio.....	Mar.	3, 1896	
PARSONS, GEORGE WELLMAN			
Supt. of Frog, Switch and Signal Dept., The Pennsylvania Steel Co., Steelton, Pa.....	Sept.	3, 1884	
PEVERLEY, RALPH			
156 Fifth Ave., New York City.....	Dec.	6, 1898	
PHILLIPS, HENRY AYLING			
Archt., 120 Tremont St., Boston, Mass.....	April	7, 1886	
PHIPPS, LAWRENCE COWLE			
Carnegie Bldg., Pittsburg, Pa.....	Jan.	31, 1899	
PIPER, ALEXANDER ROSS			
Capt., U. S. A. (<i>Retired</i>); Gen. Mgr., Mica Boiler Covering Co., Ossining, N. Y	June	5, 1900	
POLK, WILLIAM ANDERSON			
42 Hudson St., New York City.....	May	4, 1897	
POMEROY, LEWIS ROBERTS			
Care, Gen. Elec. Co., 44 Broad St., New York City.....	April	2, 1890	
PRATT, ROBERT JAMES			
With Honolulu Iron Works Co., Honolulu, Hawaiian Islands...	May	4, 1887	
QUINCY, CHARLES FREDERICK			
Pres., Railroad Supply Co., Bedford Bldg., Chicago, Ill.....	Feb.	4, 1896	
RANSOME, ERNEST LESLIE			
Concrete Engr., 532 Ninth St., Brooklyn, N. Y.....	June	5, 1894	
RICHARDSON, CLIFFORD			
Director, New York Testing Laboratory, Long Island City, N. Y. (Res. 122 East 34th St., New York City).....	Oct.	4, 1892	
ROBERTS, WILLIAM			
South St., Waltham, Mass.....	June	4, 1884	
ROGERS, EDWARD ALVERSON			
371 West 116th St., New York City	Dec.	1, 1896	
SAEGER, CHARLES MARSHALL			
Gen. Mgr., Coplay Cement Mfg. Co., 1320 Hamilton St., Allen- town, Pa.....	May	2, 1893	
SAPH, AUGUSTUS VALENTINE			
Fellow in Civ. Eng., Cornell Univ., Ithaca, N. Y.....	Oct.	1, 1901	
SAWYER, JACOB HERBERT			
93 Federal St., Boston, Mass.....	May	1, 1900	
SELL, WILLIAM DRUMM			
Room 6, Charleston Nat'l Bank Bldg. (P. O. Box 222), Charleston, W. Va.....	Jun.	Dec. 3, 1891 Assoc. May 2, 1899	
SMITH, FRANCIS HOPKINSON			
16 Exchange Pl., New York City.....	April	5, 1892	

Date of
Membership.

SMITH, HERBERT STEARNS SQUIER			
Prof. of Applied Mechanics, Princeton Univ., P. O. Box 171, Princeton, N. J.....		Sept. 10, 1891	
SPEED, JAMES BRECKINRIDGE			
Pres., Western Cement Assoc., Louisville, Ky.....	May	2, 1888	
STOWE, CHARLES BROWN			
Superior Bldg., Cleveland, Ohio.....	Oct.	4, 1898	
TENNEY, GEORGE OLIVER	{ Jun.	Sept. 7, 1887	
Contr., Spartanburg, S. C.....	{ Assoc.	Feb. 5, 1901	
THORN, ALFRED WILLIAM			
Gen. Mgr., Thorn Cement Co., 112 Church St., Buffalo, N. Y....	Oct.	2, 1900	
TOMKINS, CALVIN			
120 Liberty St., New York City	Jan.	6, 1886	
TRAUTWINE, JOHN CRESSON, Jr.			
257 South 4th St., Philadelphia, Pa.....	Dec.	5, 1888	
TRIEST, WOLFGANG GUSTAV FELIX	{ Jun.	Sept. 3, 1890	
(Snare & Triest), 39 Cortlandt St., New York City.....	{ Assoc.	Mar. 6, 1900	
TURNEAURE, FREDERICK EUGENE			
Prof. of Bridge and San. Eng., Univ. of Wisconsin, Madison, Wis.....			Aug. 31, 1897
TURRILL, SHERMAN MARSH			
Mem., Eng. Dept., Rome, Watertown & Ogdensburg Div., N. Y. C. & H. R. R. R., Watertown, N. Y.....	Oct.	1, 1901	
WARDER, JOHN HAINES			
Secy., Western Society of Engineers, 1737 Monadnock Blk., Chi- cago, Ill.....	Mar.	7, 1888	
WATKINS, JOHN ELFRETH			
Chf. of Bldgs., Supt. and Curator of Technology, U. S. Na- tional Museum, Washington, D. C.....	Jan.	2, 1889	
WEBER, GEORGE ADAM			
Secy., The Weber Railway Joint Mfg. Co., 71 Broadway, New York City.....	Feb.	6, 1900	
WELLS, JOSEPH AGUR			
The Fairbanks Co., 311 Broadway, New York City.....	Jan.	7, 1896	
WILLSON, FREDERICK NEWTON			
Prof. of Descriptive Geometry and Technical Drawing, { Jun. Princeton Univ., P. O. Box 63, Princeton, N. J.....	{ Assoc.	Sept. 5, 1883 Oct. 4, 1892	
YOUNG, CHARLES GRIFFITH			
Care, J. G. White & Co., 29 Broadway, New York City.....	Mar.	6, 1894	
ZIPPERLEIN, JOSEPH WILLIAM			
Vice-Pres., Wm. G. Hartranft Cement Co., Real Estate Trust Bldg., Philadelphia, Pa.....	June	4, 1901	

JUNIORS.

[Jun. Am. Soc. C. E.]

		Date of Membership.
ADAMS, ARTHUR		
132 Oneida St., Utica, N. Y.....		Oct. 1, 1901
ADAMS, RAYMOND EDMOND		
Recorder, U. S. Engr. Office, 815 Witherspoon Bldg., Philadelphia, Pa.....		May 1, 1900
ADEY, WILLIAM HENRY		
127 Remsen St., Cohoes, N. Y.....		Feb. 4, 1896
ALBREE, RALPH		
14 Market St. (Res., 187 Western Ave.), Allegheny, Pa.....		Oct. 4, 1898
ALLEN, WALTER HINDS		
Asst. Engr., Hartford and Air Line-Northampton Divs., N. Y., N. H. & H. R. R., 382 Crown St., New Haven, Conn.....		May 1, 1900
ANDERSON, JAMES CHRIS		
77 Sherman Pl., Jersey City, N. J.....		Sept. 10, 1891
ARN, WILLIAM GODFREY		
Asst. Engr., L. & N. R. R., Montgomery, Ala.....		Oct. 2, 1900
AURYANSEN, FREDERICK		
Chf. Draftsman, Atlantic Ave. Impvt., L. I. R. R., 44 Court St., Brooklyn, N. Y.....		Oct. 5, 1897
BAKER, SHIRLEY		
Fruit Vale, Alameda Co., Cal. (Care, Mrs. A. D. Wilson).....		Sept. 11, 1900
BARRIGER, JOHN WALKER, Jr.		
Engr., The Kansas City Southern Ry. Co., 506 Temple Blk., Kansas City, Mo.....		May 31, 1898
BARTRAM, GEORGE CORRIE		
Res. Engr., Phoenix Bridge Co., 153 Milk St., Boston, Mass.....		Jan. 31, 1899
BAXTER, DAVID ELDER		
32 West 60th St., New York City.....		May 2, 1899
BEACH, JAMES GEORGE		
121 Murray St., Binghamton, N. Y.....		Aug. 31, 1897
BEEKMAN, JOHN VAN DER VEER, Jr.		
4 Post Office Sq., Boston, Mass.....		Sept. 3, 1901
BELZNER, THEODORE		
Insp. of Steel Constr., Rapid Transit R. R. Comm., 13 Astor Pl. (Res., 142 West 67th St.), New York City.....		Oct. 5, 1897
BENTON, LEWIS STEUERWALD		
621 Broadway, Room 903, New York City.....		Nov. 5, 1901
BLACKWELL, PAUL ALEXANDER		
(With Fort Pitt Bridge Works), Canonsburg, Pa.....		Dec. 4, 1900

Date of
Membership.

BLANCHARD, ARTHUR HORACE		
Instr. in Math. and Civ. Eng., Brown Univ., 12 Mawney St., Providence, R. I.....	Jan. 2, 1900	
BOGEN, LOUIS EDWARD		
547 Hale Ave., Avondale, Cincinnati, Ohio.....	April 30, 1895	
BOUTON, GEORGE HAROLD		
Asst. Chf. Engr., Jersey City Water Supply Co., Boonton, N. J..	May 2, 1899	
BOWDITCH, ERNEST W.		
60 Devonshire St., Boston, Mass. (also 717 Hiecox Bldg., Cleve- land, Ohio).....	Feb. 3, 1875	
BRADSHAW, SAM WIGFALL		
Care, Pennsylvania Steel Co., Bridge and Constr. Dept., Steel- ton, Pa.....	Oct. 2, 1900	
BROWN, COLLINGWOOD BRUCE, Jr.		
Trail, B. C., Canada.....	Oct. 1, 1901	
BROWN, WILLIAM CLINTON		
Box 14, Brooklyn, N. Y. (Res., Dongan Hills, Staten Island, N. Y.) ..	Sept. 1, 1886	
BRUSH, WILLIAM WHITLOCK		
Asst. Engr., Dept. of Water Supply, Gas and Electricity, Room 41, Municipal Bldg., Brooklyn, N. Y.....	Mar. 3, 1896	
BUCK, HENRY ROBINSON		
Asst. Engr. in Chg. of Sewers, Hartford, Conn.....	June 5, 1900	
BUMSTED, EUGENE BRADFORD		
Engr. of Constr., for The T. A. Gillespie Co., Massena, N. Y....	May 1, 1900	
BUNNEL, WILLIAM CYRUS		
U. S. Junior Engr., U. S. Engr. Office, Charleston, S. C.....	Oct. 1, 1901	
BURGESS, GEORGE HECKMAN		
Asst. Engr., Pennsylvania Lines West of Pittsburg; Address, Care, Penna. Lines, Pittsburg, Pa.....	Feb. 1, 1898	
BURWELL, ROBERT LEMMON		
New London, N. C.....	Dec. 3, 1901	
CÁCERES, SIMON NOVELO		
P. O. Box 54, Coronado, Cal.....	June 6, 1899	
CAMERON, JOHN BOBBS		
Asst. Engr., Southern Ry., 820 Holland Bldg., St. Louis, Mo... .	Oct. 2, 1900	
CARLIN, JOSEPH PATRICK		
Care, P. J. Carlin & Co., 26 Court St. (Res., 113 Clinton Ave.), Brooklyn, N. Y.....	Oct. 4, 1898	
CARNEY, EDWARD JOSEPH		
Dept. of Bridges, 19 Park Row (Res., 53 West 68th St.), New York City.	Feb. 1, 1898	
CARPENTER, ALLAN WADSWORTH		
Acting Supr. of Bridges and Bldgs., N. Y. C. & H. R. R. R., Jersey Shore, Pa.,.....	Mar. 5, 1901	
CHADBOURN, WILLIAM HOBES, Jr.		
Superv. Engr., Pratt, Read & Co., Deep River, Conn.....	Dec. 3, 1890	

CLARK, JOHN A., Jr.		
Supt., Distribution of Orange and Montclair Districts Essex & Hudson Gas Co., 258 No. Park St., East Orange, N. J.....	Aug. 31, 1897	
CLARK, WILLIAM GEORGE		
Cons. Engr., 2024 School Pl., Toledo, Ohio.....	April 4, 1888	
CLARKE, ST. JOHN		
Bogota, Bergen Co., N. J.....	Sept. 5, 1888	
CLEAVER, PITSON JAY		
344 Lafayette Ave., Brooklyn, N. Y.....	April 4, 1899	
CODWISE, HENRY ROGERS		
Instr. in Eng., Poly. Inst. of Brooklyn; Instr. in Math. and Surv., Cooper Union, New York City.....	April 2, 1901	
COLBY, SAFFORD KINREAD		
Eastern Agt., The Pittsburg Reduction Co., 99 John St., New York City.....	Mar. 5, 1895	
CONNICK, HARRIS DE HAVEN		
Asst. Engr., Dept. of Public Works, City Hall, San Francisco, Cal.....	Jan. 3, 1899	
CONROW, HERMAN		
Dept. of Docks and Ferries, Pier A, New York City.....	May 3, 1898	
CORNELL, JOHN NELSON HAYWARD		
312 Manhattan Ave., New York City.....	May 1, 1889	
CORRIGAN, GEORGE WASHINGTON		
Res. Engr., St. Louis, Iron Mountain & Southern Ry., Hamburg, Ark. .	Feb. 5, 1901	
CRAIG, WASHINGTON RIGHTER		
Engr., M. of W., Pittsburg, Shawmut & Northern R. R. Co., St. Marys, Pa	May 1, 1894	
CRANE, WILL EDWIN		
34 Mechanics Ave., Tarrytown, N. Y.....	May 1, 1889	
CRAWFORD, JOSEPH EMMANUEL		
Fox Chase, Philadelphia, Pa	Dec. 5, 1899	
CULGIN, GUY WHITMORE		
Asst. Engr., Rapid Transit R. R. Comm.; Address, 133 West 129th St., New York City.....	Mar. 6, 1900	
CUMMINGS, NOAH		
Bridge Draftsman, East River Bridge No. 4, Dept. of Bridges, City of New York, 252 West 135th St., New York City.....	Mar. 3, 1896	
DANA, RICHARD TURNER		
Asst. Engr., Erie R. R. (N. Y. Div.), Ridgewood, N. J.....	Sept. 11, 1900	
DARROW, MARIUS SCHOONMAKER		
Care, Chf. Engr. Office, C., B. & Q. R. R., 209 Adams St., Room 67, Chicago, Ill.....	Feb. 6, 1900	
DAY, ARTHUR MORTIMER		
N. Y. C. & H. R. R., Grand Central Station, New York City.	May 1, 1900	
DE LA MORA, MANUEL		
Apartado 319, Guadalajara, Mexico	Dec. 28, 1900	

Date of
Membership.

DE OBALDIA, JOSÉ ARISTIDES		
David, Panama, Republic of Colombia.....	Oct.	4, 1898
DERLETH, CHARLES, JR.		
Prof. of Civ. Eng., State Univ. of Colorado, Boulder, Colo.....	Feb.	1, 1898
DIEHL, GEORGE CONRAD		
(Guthrie & Diehl), 836 Ellicott Sq., Buffalo, N. Y.....	Feb.	4, 1896
DIMOND, JAMES RENWICK		
20 West 73d St., New York City.....	Sept.	3, 1901
DIXON, DE FOREST HALSTED		
2 West Hamilton Pl., Jersey City, N. J.....	May	3, 1898
DOUGAN, JAMES		
Asst. Engr. with Clinton & Russell, 32 Liberty St., New York City.....	Mar.	5, 1901
DUFOUR, FRANK OLIVER		
Instr. in Civ. Eng., Lehigh Univ., 462 Walnut St., South Beth- lehem, Pa.....	Dec.	5, 1899
DUSENBERRY, WALTER LORTON		
220 Tenth St., South Brooklyn, N. Y.....	Nov.	5, 1890
ELY, JOHN ANDREWS, JR.		
21 East 55th St., New York City.....	April 30,	1901
ENOS, GEORGE WALLACE		
Contrs.' Plant, Tools and Supplies, 27 William St., New York City.....	Mar.	6, 1900
ENZIAN, CHARLES		
Asst. Engr., L. C. & Nav. Co., Catasauqua, Pa.....	Sept.	3, 1901
FALK, MYRON SAMUEL		
Tutor, Dept., Civ. Eng., Columbia Univ. (Res., 63 East 74th St.), New York City.....	Feb.	4, 1902
FARGUSSON, MARK		
Care, Holland Torpedo Boat Co., 100 First St., Elizabethport, N. J.....	Dec.	5, 1888
FAY, FREDERIC HAROLD		
Asst. Engr., Eng. Dept., 60 City Hall, Boston, Mass.....	Oct.	2, 1894
FENKELL, GEORGE HARRISON		
Chf. Draftsman, Board of Water Commrs., Detroit, Mich.....	Jan.	3, 1899
FIRTH, ELMER WALLACE		
Dept. of Sewers (Res., 473 Fourteenth St.), Brooklyn, N. Y.....	Jan.	7, 1896
FISHER, WAGER		
Room 906, Crozer Bldg., 1420 Chestnut St., Philadelphia, Pa....	Oct.	3, 1899
FLYNN, BENJAMIN HARRISON		
Engr. to the Ohio State Board of Health, 694 Neil Ave., Colum- bus, Ohio.....	Oct.	2, 1900
FORBES, HENRY DE BRETON		
Constr. Dept., N. Y., N. H. & H. R. R., 251 Center St., West Haven, Conn.....	Dec.	4, 1900

FORD, WILLIAM HAYDEN	213 East German St., Baltimore, Md. (Care, C. P. Matlack).....	Nov. 5, 1895
FRASER, CHARLES EDWARD	193 St. Nicholas Ave., New York City.....	June 4, 1901
FROST, GEORGE SHERMAN	Asst. Engr., Rapid Transit R. R. Comm., 147 Columbus Ave.; Address, 318 East 124th St., New York City.....	April 2, 1901
FULLER, ANDREW DANIEL	Cons. and Contr. Engr., 3 Hamilton Pl., Boston, Mass.....	Dec. 6, 1898
FULLER, CARL HAMILTON	Care, E. C. & R. M. Shankland, 1106 Rookery Bldg., Chicago, Ill.	Mar. 5, 1901
FURMAN, JOB ROCKFIELD	Engr., Otis Elevator Co., 71 Broadway, New York City.....	July 2, 1890
GARTENSTEIG, CHARLES	Asst. Engr., Dept. of Sewers, Borough of the Bronx, 14 East 87th St., New York City.....	Oct. 6, 1896
GIFFORD, HARRY VAN VLECK	Care, Riggs & Sherman, Civ. and Cons. Engrs., 613 The Nasby, Toledo, Ohio.....	Mar. 5, 1901
GIFFORD, LESTER ROBINSON	Office of Structural Engr., Cambria Steel Co., Johnstown, Pa...	Mar. 3, 1896
GIVEN, RICHARD ALEXANDER	Asst. Engr., Y. & M. V. R. R., Calhoun St. Station, Memphis, Tenn.....	June 6, 1899
GOODRICH, ERNEST PAYSON	Civ. Engr., U. S. N. Navy Yard, Brooklyn, N. Y.....	April 3, 1900
GOODRIDGE, JOHN WESLEY	Asst. Engr., Rapid Transit R. R. Comm., 1st Div., 13 Astor Pl., New York City (Res., 112 St. Marks Ave., Brooklyn, N. Y.)...	Oct. 4, 1898
GORMLY, WALTER BRUCE	Engr., Commr. of Accounts Dept. (Res., 81 Morningside Ave.), New York City.....	Mar. 31, 1896
GOWEN, SUMNER	Draftsman, Phoenix Bridge Co., Phoenixville, Pa.....	May 2, 1899
GRANBERY, JULIAN HASTINGS	Asst. Engr., Manhattan Ry. Co., 32 Park Pl., New York City (Res., 670 Pennsylvania Ave., Elizabeth, N. J.).....	Sept. 6, 1898
GRAVES, WILLARD FRANKLIN	Engr., M. of W., Choctaw, Oklahoma & Gulf Ry., Shawnee, Okla. T.....	Oct. 31, 1899
GRAY, JOHN COLIN	36 Garden Pl., Brooklyn, N. Y	June 4, 1901
GREEN, FRANCIS CUSHING	Gen. Supt., Consolidated Car-Heating Co., 413 North Pearl St., Albany, N. Y.	Feb. 4, 1896
GRIMM, HENRY ENGLAND	Asst. Engr., Terminal R. R. Assoc. of St. Louis, Room 206, Union Station (Res., 3213 Eads Ave.), St. Louis, Mo.....	Oct. 2, 1900

Date of
Membership.

HAIGHT, HORACE DE REMER		
Chf. Engr., Sun Portland Cement Co., Owen Sound, Ont., Canada	May 1, 1900	
HALL, CHARLES WARD		
140 Nassau St., New York City.....	Sept. 6, 1898	
HALL, FREDERIC FRANCIS		
Care, Hall & McChesney, Syracuse, N. Y.....	June 5, 1900	
HALL, MARTIN WELCH		
Transitman, Dept. of Sewers, Bronx (Res., 595 East 134th St.), New York City.....	Oct. 1, 1901	
HAMILL, ALEXANDER, Jr.		
Jersey City, N. J.....	Dec. 28, 1900	
HAMMER, ROBERT HENRY		
4 Dean St., Brooklyn, N. Y.....	Jan. 7, 1902	
HANKINSON, ALBERT WORTHINGTON		
62 West 85th St., New York City.....	Oct. 2, 1894	
HARBY, ISAAC		
238 West 112th St., New York City.....	June 6, 1899	
HARDING, WILLIAM STEWART		
Bituminous Coal Operator, Lloydell, Cambria Co., Pa. (Mines); Office, 308 Harrison Bldg. (Res., 3411 Hamilton St.), Phila- delphia, Pa.....	Nov. 3, 1896	
HARRINGTON, FRANCIS BURCHARD		
Asst. Supt. of Signals, Mohawk Div., N. Y. C. & H. R. R. Co., 93 Ten Broeck St., Albany, N. Y.....	Sept. 11, 1900	
HARRINGTON, HARRY GARFIELD		
39 Pacific St., Newark, N. J.....	Jan. 7, 1902	
HARRIS, HENRY ALEXANDER		
Princeton, N. J.....	Oct. 31, 1899	
HARSHBARGER, ELMER DWIGHT		
Asst., Bureau of Filtration, Pittsburgh, Pa.; Box No. 1, Aspin- wall, Pa.....	Nov. 5, 1901	
HARWI, SOLOMON JACOB		
Civ. Engr. for The Babcock & Wilcox Co., New York City (Res., 910 Avenue C, Bayonne, N. J.).....	Dec. 4, 1889	
HAWKS, ARCHIE MCLEAN		
Civ. and Hydr. Engr., 402 Berlin Bldg., Tacoma, Wash.....	Nov. 2, 1887	
HENLEY, ROBERT DWIGGINS MONTEITH		
Office of Chf. Engr., L. & N. R. R., Louisville, Ky	Sept. 3, 1901	
HIGGINSON, JONATHAN YATES		
215 East 15th St., New York City.....	Oct. 1, 1901	
HOLLINGSWORTH, CREIGHTON HAMILTON		
Supt. of Constr. and Res. Engr. for Garrett-Cromwell Engineer- ing Co., Pueblo, Colo.....	Mar. 2, 1897	
HOPPER, JOHN JACOB		
Civ. Engr. and Contr., 215 West 125th St., New York City.....	May 5, 1886	
HORTON, SANDFORD		
214 N. Summit St., Indianapolis, Ind.....	Feb. 7, 1877	

HOW, RICHARD WILLIS	Care, Atlantic Ave. Impvt., Temple Bar Bldg., 44 Court St., Brooklyn, N. Y.....	June 6, 1899
HOWARD, ERNEST EMMANUEL	Asst. to Res. Engr., Red River Bridge at Alexandria (Waddell & Hedrick, Cons. Engrs. to S. & R. R. V. Ry.), P. O. Box 502, Alexandria, La.....	Dec. 3, 1901
HOWE, CHARLES EDWARD	Chf. Edgr., Wabash Bridge & Iron Works, Wabash, Ind.....	Mar. 6, 1900
HYDE, WILLIAM HERBERT	Rice's Landing, Greene Co., Pa.....	April 30, 1901
ILSLEY, ARTHUR BENJAMIN	Asst. Bridge Engr., B. & M. R. R., Care, Chf. Engr.'s Office, Boston, Mass.....	Feb. 28, 1899
INGALLS, OWEN LOVEJOY	Asst. Engr., District Govt., Washington, D. C.; Address, 2148 P St., N. W., Washington, D. C.....	Mar. 5, 1890
IRVING, WALTER EDWARD	142 Fifth Ave., New York City.....	Feb. 1, 1898
IVES, HOWARD CHAPIN	Instr. in Civ. Eng., Worcester Polytechnic Inst., Worcester, Mass.	Dec. 3, 1901
KAST, CLARKE NIGHTINGALE	Jennings, Flathead Co., Mont.....	June 4, 1901
KELLY, OLAF MORROGH	117 East 59th St., New York City.....	Dec. 6, 1898
KIBBE, AUGUSTUS SAYRE	Chf. Engr., The American Railways Co., 905 Witherspoon Bldg., Philadelphia, Pa.....	Mar. 6, 1889
KLINE, VICTOR WITMER	With Dravo Contracting Co., Pittsburg, Pa.; P. O., Coraopolis, Pa.....	Oct. 3, 1899
C. KUMMER, FREDERIC ARNOLD	Pres., United States Wood Preserving Co., 29 Broadway, New York City.....	April 30, 1895
LAMBIE, CHARLES SUMNER	7 Cliff St., Pittsburg, Pa.....	Oct. 1, 1901
LANT, FRANK PARSONS	2601 Broadway, New York City.....	Oct. 3, 1888
LATHAM, NORMAN SMITH	589 Eleventh St., Brooklyn, N. Y.....	July 3, 1889
LATTING, BENJAMIN FRANKLIN	Care, Mt. Vernon Bridge Co., Mt. Vernon, Ohio.....	Oct. 6, 1896
LEWIS, HARRY BLAKEMAN	Engr., Pole Line Constr., Constr. Dept., New York Telephone Co., 32 Gold St., New York City.....	Oct. 1, 1895

Date of
Membership.

LEWIS, MYRON HENRY		
14 East 120th St., New York City.....	April	2, 1901
LIVERMORE, NORMAN BANKS		
Mgr., Norman B. Livermore & Co., Engrs., Contrs. and Gen.		
Agts., 320 Sansome St., San Francisco, Cal.....	Dec.	5, 1899
MACCRACKEN, GEORGE GERE		
University Heights, New York City.....	Feb.	5, 1901
MACCREA, DON ALEXANDER		
Div. Engr., C., O. & G. R. R., Little Rock, Ark.....	May	2, 1899
MACDONALD, ARCHIBALD ANGUS		
32 Liberty St., New York City.....	June	4, 1901
McCAFFERY, RICHARD STANISLAUS		
Supt., Santa Fe Gold and Copper Co., San Pedro, N. Mex.....	May	4, 1897
MCFETRIDGE, WILLIAM SUTTON		
Supt., Parral & Durango R. R., Parral, Chihuahua, Mexico.....	May	3, 1898
MC HARG, LESLIE		
49 Wall St., Room 1713, New York City.....	Mar.	5, 1901
McKEEVER, WILLIAM		
566 East 164th St., New York City.....	Jan.	2, 1900
MCLEOD, HUGH		
Care, Clarke Fork Coal Mining Co., Gebo, Mont.....	Oct.	3, 1899
MACHEN, HENRY BENNETT		
Asst. Engr., Rapid Transit Comm., 231 West 125th St. (Res., 231		
West 96th St.), New York City.....	May	2, 1899
MACY, ELBERT CLYDE		
Asst. Engr., Britannia Mining Syndicate, Vancouver, B. C.,		
Canada.....	May	2, 1899
MANN, JOHN LAROY		
Hanover, N. H.....	April	2, 1901
MARVELL, EDWARD IRA		
Civ. and Mech. Engr., 81 Bedford St., Fall River, Mass.....	Feb.	2, 1897
MASON, FRANCIS		
Asst. Engr., N. Y. C. & H. R. R., 194 State St., Albany, N.Y..	April	3, 1900
MELIUS, LUDLOW LAWRENCE		
30 South Hawk St., Albany, N. Y.....	May	2, 1899
MERRIMAN, THADDEUS		
Insp., The Guayaquil & Quito Ry. Co., 33 Wall St., New York		
City.....	April	4, 1899
MERZ, LEON		
704 N. 5th St., Philadelphia, Pa.....	Mar.	5, 1901
MILLARD, CURTISS		
Gen. Mgr., C., P. & St. L. Ry. Co. of Ill., Springfield, Ill.....	April	3, 1889
MILLER, REUBEN, JR.		
Crescent Steel Co., Pittsburg, Pa.....	Oct.	4, 1892
MINOR, EDWARD EASTMAN		
(With A. B. Hill, Cons. Engr.), 123 Columbus Ave., New Haven,		
Conn.....	May	1, 1900

MONSARRAT, NICHOLAS DAUBENEY		
Supt., Kanawha & Hocking Coal & Coke Co., Cedar Grove, W. Va.....	Fe.b.	5, 1895
MORE, CHARLES CHURCH		
Draftsman, Eastern Div., American Bridge Co., Pencoyd, Pa..	May	2, 1899
MYERS, CHESTER JOHN		
Care, Water Dept., Atlantic City, N. J.....	Oct.	1, 1901
NAYLOR, EZRA BOOTH		
43 Van Sice Ave., Yonkers, N. Y.....	Oct.	1, 1890
NELSON, ALEXANDER HOWARD		
200 Lewis Bldg., Pittsburg, Pa.....	Nov.	1, 1898
NEVILLE, COLONE WILL JACKSON		
Asst. Prof. of Civ. Eng., Iowa State College, Ames, Iowa.....	Oct.	1, 1901
NORRIS, ROBERT VAN ARSDALE		
Chf. Engr., Coal Cos. of Pennsylvania R. R. Co., Wilkesbarre, Pa.....	Dec.	7, 1887
NOSKA, GEORGE ALBERT		
33 East 17th St., New York City	Mar.	31, 1896
NOSTRAND, GEORGE ELBERT		
2090 Amsterdam Ave., New York City.....	Feb.	5, 1895
NUTTER, CHARLES HERBERT		
144 Lexington Ave., New York City.....	Feb.	5, 1901
NYE, ALGERNON SIDNEY		
Asst. Engr. to the Aqueduct Commrs., Kingsbridge, New York City.....	July	2, 1890
ORR, ALEXANDER		
Supt., Gloversville Water-Works, Gloversville, N. Y.....	June	4, 1901
PAIN, GEORGE HEBARD		
Civ. and Cons. Engr., 32 Park Pl., New York City.....	Nov.	5, 1890
PARKER, ASA WARREN		
Second Ave. and 67th St., Brooklyn, N. Y.....	Sept.	11, 1900
PARKER, CHARLES FREDERIC		
Care, San Carlos Copper Co., Linares, N. L., Mexico.....	June	5, 1900
PERRING, HENRY GARFIELD		
Care, Choctaw, Oklahoma & Gulf R. R. Co., Little Rock, Ark...	Dec.	4, 1900
PERRY, GEORGE FRANKLIN		
With J. G. White & Co., Ltd., 22a College Hill, E. C., London, England.....	April	3, 1900
PISTOR, GEORGE EMIL JOHN		
518 Broad St., Newark, N. J.....	Dec.	3, 1901
PITTS, THOMAS DORSEY		
Chf. Draftsman, Tams & Lemoine, Naval Archts., 52 Broadway, New York City	Dec.	7, 1897

Date of
Membership.

POLLEDO, YSIDORO	Vinda de Montero y Cia. para Y Polledo, Teniente Rey 16, Havana, Cuba.....	Jan. 2, 1889
POTTS, CLYDE	U. S. Engr. Office, 33 Campau Bldg., Detroit, Mich.....	Dec. 3, 1901
PRICE, PHILIP WALLIS	Office of Asst. Engr., Pittsburg Div., Pennsylvania R. R., Oakmont, Pa.....	April 2, 1901
PRUETT, WILLIAM ELISHA	Asst. Engr. for Waddell & Hedrick, 608 New Nelson Bldg., Kansas City, Mo.....	Dec. 4, 1900
RAMSEY, EDMUND PAYTON	Asst. Engr., First Div., Rapid Transit R. R. Comm., 13 Astor Pl., New York City (Res., 11 Willoughby Ave., Brooklyn, N. Y.).....	Feb. 6, 1900
REED, WILLIAM BELDEN, Jr.	Gen. Mgr., White Mfg. Co., 556 West 34th St., New York City..	Dec. 1, 1896
RHEA, WILLIAM DOUGLAS	(Craik & Rhea, Contrs. and Miners of phosphate rock), Mt. Pleasant, Tenn.....	Oct. 4, 1898
RICHARDSON, JOHN FRANCIS	Asst. Engr., Sewerage and Water Board, 602 Carondelet St., New Orleans, La.....	Oct. 3, 1899
RIDGWAY, ROBERT	Asst. Engr., Rapid Transit R. R. Comm., 147 Columbus Ave., New York City.....	Feb. 1, 1888
RIEDEL, ARTHUR EMIL	62 William St., Room 34, New York City.....	Nov. 5, 1901
ROCKWELL, JAMES VINCENT	Asst. Engr., C. & N. W. Ry.; Care, Div. Engr., Baraboo, Wis....	April 3, 1900
ROHNERT, BENNO	U. S. Asst. Engr., Sault Ste. Marie, Mich.....	April 3, 1889
ROMMEL, GEORGE, Jr.	First Asst. Engr., in Chg. of Sewers, 233 Broome St., Wilmington, Del.....	Jan. 3, 1899
RUILLOBA, JOSÉ ANTONIO	With United States Steel Corporation, 71 Broadway, New York City.....	Oct. 4, 1892
RUNYON, WILLIAM KERPER	The Cuba Co., Puerto Principe, Cuba.....	April 5, 1898
RYAN, MICHAEL HEALEY	Asst. Engr., Rapid Transit R. R. Comm., 1161 Amsterdam Ave., New York City.....	Dec. 3, 1901
RYDER, ELY MORGAN TALCOTT	41 Lynwood St., New Haven, Conn.....	Jan. 5, 1897
ST. JOHN, RICHARD COLLIER	143 Liberty St., Room 909, New York City.....	Oct. 1, 1890

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Date of
Membership.

SCHODER, ERNEST WILLIAM 410 E. Yates St., Ithaca, N. Y.....	Oct. 1, 1901
SCHWIERS, FREDERICK WILLIAM 751 Amsterdam Ave., New York City.....	June 5, 1900
SELBY, OSCAR ELLSWORTH Asst. Engr., C. C., C. & St. L. Ry., Cincinnati, Ohio.....	Mar. 4, 1891
SENIOR, FRANK SEARS With Arthur McMullen & Co., Contrs.; Montgomery, N. Y.....	Feb. 28, 1899
SESSER, JOHN CORNELIOUS Res. Engr., C. M. & St. P. Ry., St. Joseph, Mich.....	Sept. 5, 1899
SHIRE, MOSES EDMUND First Asst. Engr., Chicago Transfer & Clearing Co., 355 Dearborn St., Chicago, Ill.....	April 2, 1901
SHRYOCK, JOSEPH GRUNDY Pencoyd Iron Works; Address, 21 North 7th St., Philadelphia., Pa.....	April 2, 1901
SINNICKSON, GEORGE ROSENKRANTZ Asst. Superv., P. R. R., Tacony, Pa.....	Sept. 5, 1899
SKELLY, JAMES WILLIAM Care, Asst. Engr.'s Office, Missouri Pacific Ry., Sedalia, Mo.....	May 2, 1899
SMITH, CHARLES HORTON City Engr., Room 5, Times Bldg., Middletown, N. Y.....	June 4, 1890
SMITH, MARION DEKALB, Jr. 6 Washington Ave., Chestertown, Md.....	Oct. 1, 1901
SMITH, MERRITT HAVILAND Engr., Finance Dept., 280 Broadway, Room 52, New York City (Res., 1 Overlook Terrace, Yonkers, N. Y.).....	June 5, 1889
SPEIDEL, HUGO S Vice-Pres. and Mgr., The David Henry Bldg. Co., cor. Main and Smith Sts., Paterson, N. J.....	Feb. 5, 1890
SPENCER, LOUIS BERNARD 2555 Jefferson Ave., Ogden, Utah.....	Oct. 31, 1899
STARR, WILLIAM H Supt., Western Div., Chicago & Alton R. R., Kansas City, Mo..	April 2, 1884
STEFFENS, WILLIAM FREDERICK Care, Bridge Engr., N. Y. C. & H. R. R. R., Room 500, Grand Central Station, New York City.....	April 3, 1900
STEVENS, PERLEY EGBERT Draftsman in Chg., Dept. Y. & D., League Island Navy Yard; Address, 1710 No. Park Ave., Philadelphia, Pa.....	April 6, 1897
STEWART, JOHN HENRY 123 West 11th St., New York City.....	Nov. 3, 1896
STEWART, WILLIAM JAMES First Asst. City Engr., Rochester, N. Y.....	May 7, 1890
STIGER, JOHN SHARP, Jr. Mendham, N. J.....	Oct. 2, 1900
STOUDER, JOHN BURTON Roadmaster, Chicago & Northwestern Ry., Mason City, Iowa...	Mar. 6, 1900

		Date of Membership.
STRAWN, THOMAS CORWIN		
1003 Penn Ave., Pittsburg, Pa.....	Nov. 5, 1901	
SWINDELLS, JOSEPH SPRINGER		
Asst. Engr., New Croton Dam, 3 Jane St., Mt. Kisco, N. Y.....	Feb. 2, 1897	
TAPPAN, ROGER		
Boston Art Club, cor. Newbury and Dartmouth Sts., Boston, Mass.....	Dec. 3, 1884	
TAYLOR, ALEXANDER JENIFER		
900 Adams St., Wilmington, Del.....	Oct. 3, 1899	
TAYLOR, HOWARD FLANDERS		
Engr., M. of W., St. L., K. C. & C. R. R. Co., Spring Garden, Mo. (Res., 115 Washington Ave., Chelsea, Mass.)......	Feb. 28, 1899	
THAYER, JAMES WARREN		
Engr. of the Scarsdale Estates, Scarsdale, N. Y.; Office, 20 Nassau St., New York City	Feb. 2, 1897	
THOMPSON, MACKEY J		
La Crosse, Wis.....	May 1, 1894	
THOMPSON, WILFORD ASHFORD		
Asst. Engr., Board of Public Works, 108 S. Conception St., Mobile, Ala.....	Oct. 1, 1901	
THOMSON, ALEXANDER, Jr.		
517 Lexington Ave., Brooklyn, N. Y.....	Dec. 4, 1900	
TILT, GARRET EDWARD		
698 E. 24th St., Paterson, N. J.....	April 4, 1899	
TOMPKINS, EDWARD DE VOE		
Bridge Engr., in Chg. of Constr. of Grand St. Bridge, Newtown Creek, Dept. of Bridges, Park Row Bldg., New York City (Res., 372 Park Pl., Brooklyn, N. Y.).....	Feb. 2, 1897	
TOWNE, JOSEPH MINOTT		
Asst. Engr., Safety Car Heating & Lighting Co., 206 Erie St., Jer- sey City, N. J.....	Dec. 5, 1899	
TRACY, LOUIS DOWNER		
539 Centennial Ave., Sewickley, Pa.....	Dec. 5, 1900	
TRAVELL, WARREN BERTRAM		
Care, C. W. Hunt Co., West New Brighton, N. Y.....	April 30, 1895	
TYRRELL, WARREN AYRES		
Chf. Engr., Christopher & Simpson, Architectural Iron & Fdy. Co., St. Louis, Mo.....	Oct. 2, 1900	
UNDERWOOD, HOWARD WARREN		
811 North 41st St., Philadelphia, Pa.....	Dec. 3, 1901	
VAN BRAKLE, JOHN OGDEN		
445 West 23d St., New York City.....	Mar. 5, 1901	
VAN LOAN, SETH MORTON		
Second Asst. Engr., Belmont Filter Plant, 2525 Belmont Ave., Philadelphia, Pa.....	Dec. 28, 1900	

VAN PELT, SUTTON			
Care, U. S. Engrs., Tuscaloosa, Ala.....		Mar.	6, 1900
VAN ZILE, HARRY LEE			
379 West End Ave., New York City.....		Jan.	6, 1886
VEUVE, ERLE LEROY			
Engr. in Chg. of Constr., United Verde & Pacific Ry., Jerome, Ariz		Sept.	3, 1901
WADSWORTH, GEORGE REED			
Res. Engr., N. Y. C. & H. R. R., Albany, N. Y.....		Feb.	6, 1900
WARD, CHARLES ROYCE			
361 West 123d St., New York City		Dec.	1, 1896
WAUGH, WILLIAM HAMMOND			
(Parker, Waugh & Co., Gen. Contrs. and Engrs.), Havana, Cuba.		Oct.	1, 1901
WELLER, FRANCIS REPETTI			
Insp., D. C. Engr. Dept., 408 C St., S. E., Washington, D. C...		Feb.	5, 1901
WELLS, CLINTON GLENCAIRN			
Engr. in Chg. of Distrib., Elec. Comm. of Baltimore City, City Hall, Baltimore, Md.....		Mar.	5, 1901
WELTON, BENJAMIN FRANKLIN			
Jay St., New Brighton, N. Y.....		April	6, 1897
WHELPLEY, JAMES RUSSELL			
Leveler, Eng. Dept., District of Columbia, 800 East Capitol St., Washington, D. C.		Oct.	1, 1901
WHITE, FRANK GEORGE			
Winterset, Iowa.....		Dec.	3, 1901
WHITE, LAZARUS			
18 West 119th St., New York City.....		May	1, 1900
WHITNEY, THOMAS BRYAN, Jr.			
Care, São Paulo Tramway, Light & Power Co., São Paulo, Brazil.		Sept.	6, 1898
WHITSON, ABRAHAM UNDERHILL			
College Point, N. Y.....		Jan.	7, 1902
WHITTED, LEVI ROMULUS			
Draftsman, Dept. Yards and Docks, Navy Yard, Norfolk, Va....		Mar.	6, 1900
WIDDICOMBE, ROBERT ALEXANDER			
Engr. with Western Electric Co. (Res., 1651 Roscoe St.), Chicago, Ill.....		April	2, 1901
WIGGIX, ERNEST WOODBURY			
Asst. Bridge Engr., N. Y., N. H. & H. R. R., New Haven, Conn.		May	5, 1896
WILCOCK, FREDERICK			
50th St., near 9th Ave., Brooklyn, N. Y.....		Jan.	7, 1902
WILCOX, CLARK LUZERNE			
Eng. Office Asst., Impvt., Extension and Filtration of Water Supply, Testing Station, Spring Garden W. W., Philadelphia, Pa.		Dec.	3, 1901
WILGUS, HERBERT SEDGWICK			
Care, M. of W. Dept., C., C., C. & St. L. Ry., Springfield, Ohio.		Oct.	1, 1901

Date of
Membership.

WILHELM, JEROME FREDERICK City Engr., Traverse City, Mich.....	Jan. 2, 1900
WILLIAMS, ROGER BUTLER, JR. 315 So. Albany St., Ithaca, N. Y.....	Oct. 1, 1901
WINCHESTER, PHILIP HAROLD 20 Winslow St., Watertown, N. Y.	Jan. 7, 1902
WOOLLAARD, GEORGE CLIFTON Engr., James Stewart & Co., P. O. Box 266, New Orleans, La., ...	April 3, 1900
WRIGHT, MOSES HANNIBAL Asst. Engr., L. & N. R. R., Nashville, Tenn.....	Jan. 2, 1900
YOUNG, HENRY AMERMAN Asst. Engr., Sewer Dept., Tacon 3, Havana, Cuba.....	Mar. 5, 1901
ZABRISKIE, AARON J. 23 Fifth Ave., New York City.....	July 1, 1885

Juniors, 255.

FELLOWS.

[F. Am. Soc. C. E.]

	Date of Membership.
ADAMS, EDWARD DEAN Pres., Cataract Const. Co., 35 Wall St., New York City.....	Mar. 31, 1891
AINSLEY, JAMES W. Care, F. H. Vaughan, 207 East College St., Louisville, Ky.....	May 28, 1872
ALBRIGHT, JOHN JOSEPH Buffalo, N. Y.....	April 20, 1886
BARBER, AMZI LORENZO 11 Broadway, New York City.....	Mar. 19, 1886
BELKNAP, WILLIAM RICHARDSON 115 West Main St., Louisville, Ky.....	May 28, 1872
BLATCHFORD, ELIPHALET W. 70 North Clinton St., Chicago, Ill.....	Feb. 6, 1873
BOUTON, NATHANIEL S. Care, Kenwood Bridge Co., 614 First Nat'l Bank Bldg., Chicago, Ill.....	Dec. 30, 1872
CHANUTE, OCTAVE (<i>Past-President.</i>) Cons Engr., 413 East Huron St., Chicago, Ill.....	{ M. Feb. 19, 1868 F. July 11, 1878
CHENEY, NATHANIEL Orange, Mass.....	June 21, 1870
CLARK, EDWARD WHITE Bullitt Bldg., Philadelphia, Pa.....	April 8, 1870
CLEMENT, VICTOR M. Cons. Min. Engr. and Metallurgist, McCornick Bldg., Salt Lake City, Utah.....	Jan. 8, 1890
COIT, EDWARD WOOLSEY Local Mgr., National Tube Works Co., St. Louis, Mo.....	Sept. 20, 1872
COLEMAN, THOMAS COOPER 252 West Main St., Louisville, Ky.....	May 28, 1872
COOPER, EDWARD 17 Burling Slip, New York City.....	Dec. 10, 1885
DARWIN, HARRY GILBERT Cons. Engr., 231 West 69th St., New York City.....	Mar. 22, 1887
DU PONT, BIDERMAN Louisville, Ky.....	Sept. 5, 1873

	Date of Membership.
EVEREST, CHARLES MARVIN Vice-Pres., Vacuum Oil Co., Rochester, N. Y.....	Nov. 1, 1892
FARREN, B. N. Montague City, Mass.....	Mar. 12, 1870
FLINT, CHARLES R. Flint & Co., 30 Broad St. (Res., 4 East 36th St.), New York City.	June 7, 1876
GREEN, SAMUEL MAGEE R. R. Contr., 41 Sentinel Bldg., Milwaukee, Wis.....	Sept. 5, 1888
GURNEE, WALTER S. 80 Broadway, New York City.....	May 10, 1870
HILL, JAMES JEROME Pres., G. N. Ry. Co., St. Paul, Minn.....	Jan. 10, 1889
HOLMAN, STEPHEN 150 Atlantic Ave., Swampscott, Mass.....	July 11, 1872
JONES, BENJAMIN FRANKLIN Pittsburg, Pa.....	June 15, 1870
KIDDLE, ALFRED WATTS 314 West 98th St., New York City.....	Oct. 3, 1893
MERRITT, GEORGE 131 William St., New York City.....	May 6, 1870
MEYER, HENRY CODDINGTON Pres., <i>The Engineering Record</i> , 100 William St., New York City..	Oct. 22, 1885
REED, WILLIAM W. 17 East 10th St., Erie, Pa.....	Dec. 20, 1872
RICHMOND, HENRY A. Buffalo, N. Y.....	July 7, 1870
RUMSEY, B. C. Buffalo, N. Y.....	May 12, 1870
STANTON, JOHN ROBERT Pres., Treas. and Secy., Lake Superior Copper Mining Co., 11 William St., New York City.....	April 4, 1899
TAYLOR, WILLIAM JOHNSTON Bound Brook, N. J.....	Mar. 10, 1870
WALKER, GEORGE CLARKE 228 Michigan Ave., Chicago, Ill.....	Feb. 6, 1873

FELLOWS.

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Date of
Membership.

WATSON, JAMES

Paterson, N. J. Dec. 5, 1872

WELTON, NELSON JAMES

Waterbury, Conn. Jan. 20, 1873

Fellows (not Members), 34.**RECAPITULATION, FEBRUARY 10th, 1902.**

Honorary Members	10
Corresponding Members	2
Members	1 512
Associate Members	629
Associates	112
Juniors	255
Fellows (not Members)	34
Total	2 554

GEOGRAPHICAL LIST OF MEMBERS.

NORTH AMERICA.

CANADA. Total Membership, 56.

Members.—*Almonte, Ont.*—A. Bell. *Berlin, Ont.*—W. H. Breithaupt. *Grand Forks, B. C.*—J. H. Kennedy. *Moncton, N. B.*—P. S. Archibald, W. B. Mackenzie. *Montreal, Que.*—H. D. Bush, G. H. Duggan, E. P. Hannaford, J. Hobson, H. S. Holt, P. Johnson, J. Kennedy, P. A. Peterson, A. W. Robinson, J. Ross, J. M. Shanly. *New Westminster, B. C.*—G. A. Keefer. *Ottawa, Ont.*—W. Crawford, S. Fleming, T. C. Keefer, J. L. P. O'Hanly. *Port Colborne, Ont.*—F. D. H. Lawlor. *Sillery, Que.*—A. A. Stuart. *St. Catharines, Ont.*—W. G. McN. Thompson. *Sault Ste. Marie, Ont.*—A. S. Crane. *Toronto, Ont.*—M. J. Butler, W. Chipman, C. E. Goad, H. Holgate, W. T. Jennings, E. H. Keating, C. H. Rust. *Trail, B. C.*—J. G. Sullivan. *Victoria, B. C.*—H. P. Bell, F. C. Gamble, A. S. Going, E. Mohun. *Winnipeg, Man.*—A. C. Dennis, H. N. Ruttan, W. F. Tye.

Associate Members.—*Fredericton, N. B.*—E. E. Brydone-Jack. *Hamilton, Ont.*—E. Fisher, R. M. Roy. *Lachine Locks, Que.*—E. A. Rhys-Roberts. *Montreal, Que.*—C. E. Gudewill, R. E. Hunter. *Ottawa, Ont.*—S. J. Chapleau. *Peterborough, Ont.*—W. J. Francis. *Shawenegan Falls, Que.*—G. P. Hawley. *Sydney, Cape Breton, N. S.*—C. R. Harte. *Vancouver, B. C.*—C. W. McMeekin.

Associates.—*Montreal, Que.*—T. J. Drummond. *Sydney, Cape Breton, N. S.*—A. J. Moxham.

Juniors.—*Owen Sound, Ont.*—H. de R. Haight. *Trail, B. C.*—C. B. Brown, Jr. *Vancouver, B. C.*—E. C. Macy.

MEXICO. Total Membership, 38.

Members.—*Chihuahua*.—E. S. Safford. *Coahuila*.—L. M. Johnson. *Coatzacoalcos*.—J. B. Body. *Colima*.—A. P. Herbert. *Culiacan*.—F. E. Butterfield. *Escalon*.—V. P. Safford. *Hermosillo*.—A. F. Wrotnowski. *Mazapil*.—R. C. Gemmell. *Mexico*.—R. E. Briggs, J. E. Earley, R. Gayol, L. Kingman, J. E. McCurdy, J. L. Phillips, A. Rosenzweig. *Monterey*.—R. Meyer, N. Turner, W. H. Wentworth. *Orizaba*.—S. W. Stacpoole. *Salina Cruz*.—R. Adam. *Saltillo*.—S. B. Burton. *San Jose de Gracia*.—E. A. H. Tays. *Tampico*.—A. B. Ross.

Associate Members.—*Chihuahua*.—F. W. Andros, O. S. Osborn. *Durango*.—R. Johnson. *Concepcion del Oro*.—A. C. Wheatley. *Mexico*.—I. Mathewson, W. G. Moler. *Monterey*.—F. H. Dillon. *Orizaba*.—R. C. Barnett. *San Luis Potosi*.—W. A. Hill. *Santa Barbara*.—W. C. Hammatt. *Vera Cruz*.—J. W. Miles.

Associates.—*Durango*.—W. W. Graham.

Juniors.—*Guadalajara*.—M. de la Mora. *Linares*.—C. F. Parker. *Parral*.—W. S. McFetridge.

UNITED STATES.

ALABAMA. Total Membership, 19.

Members.—*Birmingham*.—T. H. Aldrich, J. R. Carter, G. H. Clark, J. A. Montgomery. *Lincoln*.—D. M. Andrews. *Mobile*.—J. N. Hazlehurst, F. L. Hills. *Tuscaloosa*.—R. C. McCalla.

Associate Members.—*Birmingham*.—G. M. Braune. *Fort Morgan*.—O. F. Bellows. *Kingman*.—W. S. Winn. *Mobile*.—D. G. Anderson. *Selma*.—E. Zarbell. *Tidewater*.—C. M. Ayres. *Tuscaloosa*.—O. E. Strehlow. *University*.—G. S. Wilkins.

Juniors.—*Mobile*.—W. A. Thompson. *Montgomery*.—W. G. Arn. *Tuscaloosa*.—S. Van Pelt.

ARIZONA. Total Membership, 44.

Members.—*Prescott*.—W. A. Drake.

Associate Members.—*Naco*.—J. P. Hallihan. *Prescott*.—A. C. Hardison.

Juniors.—*Jerome*.—E. L. Veuve.

ARKANSAS. Total Membership, 12.

Members.—*Fort Smith*.—F. W. Bond, G. E. Otis. *Little Rock*.—C. Le R. Annan, F. A. Molitor, G. H. Webb. *Pine Bluff*.—E. J. Nichols.

Associate Members.—*Fayetteville*.—J. J. Knoch. *Little Rock*.—W. E. Herring, C. J. Hogue.

Juniors.—*Hamburg*.—G. W. Corrigan. *Little Rock*.—D. A. MacCrea, H. G. Perring.

CALIFORNIA. Total Membership, 68.

Honorary Members.—*San Francisco*.—G. Davidson, G. E. Gray.

Members.—*Bakersfield*.—F. C. Prindle. *Berkeley*.—J. H. Covode. *Cisco*.—C. W. Raymond. *Fresno*.—W. C. Ambrose. *Grass Valley*.—A. DeW. Foote. *Los Angeles*.—E. M. Boggs, R. B. Burns, D. W. Cunningham, F. Eaton, A. S. Hobby, J. B. Lippincott, F. H. Olmsted, J. H. Quinton, H. T. Richards, J. D. Schuyler, F. E. Trask, E. T. Wright. *Mare Island*.—H. R. Stanford. *National City*.—H. N. Savage. *Oakland*.—A. L. Adams, L. J. Le Conte. *Pasadena*.—H. Breen. *Pomona*.—A. W. Wright. *Quincy*.—J. E. Mills. *Redlands*.—W. A. Nichols. *San Francisco*.—A.

J. Bowie, G. L. Dillman, W. R. Eckart, W. C. Edes, H. D. Gates, W. D. Gelette, C. E. Grunsky, W. H. Hall, D. C. Henny, W. H. Heuer, W. Hood, J. D. Isaacs, N. B. Kellogg, M. Manson, D. E. Melliss, G. H. Mendell, F. J. H. Rickon, A. S. Riffle, F. Riffle, E. A. Rix, E. K. Smoot, O. Von Geldern, J. H. Wallace. **Santa Clara**.—C. E. Moore. **Stanford University**.—C. D. Marx. **Ventura**.—G. C. Power.

Associate Members.—**Los Angeles**.—J. C. McClure, S. Storrow. **Oakland**.—G. D. Stratton. **Palo Alto**.—J. C. L. Fish. **Pasadena**.—F. E. Wilcox. **San Francisco**.—K. Bryan, R. M. Drake, E. F. Haas, J. Jacobs. **Stanford University**.—C. B. Wing. **Ventura**.—W. S. Post.

Juniors.—**Coronado**.—S. N. Cáceres. **Fruit Vale**.—S. Baker. **San Francisco**.—H. De H. Connick, N. B. Livermore.

COLORADO. Total Membership, 20.

Members.—**Canon City**.—W. C. Wetherill. **Denver**.—M. Boehmer, C. L. Harrison, H. C. Lowrie, M. H. Rogers. **Edgewater**.—F. A. Calkins. **Leadville**.—T. W. Jaycox. **Pueblo**.—H. R. Holbrook. **Salida**.—J. W. Deen. **Telluride**.—C. W. Gibbs, J. Herron.

Associate Members.—**Delta**.—H. Rittenhouse. **Denver**.—O. O. McReynolds, E. Stenger. **Golden**.—C. W. Comstock. **Placita**.—G. N. Houston. **Pueblo**.—J. W. Martin, H. B. Rust.

Juniors.—**Boulder**.—C. Derleth, Jr. **Pueblo**.—C. H. Hollingsworth.

CONNECTICUT. Total Membership, 48.

Members.—**Berlin**.—D. E. Bradley. **Danbury**.—J. W. Bacon. **Derby**.—D. S. Brinsmade. **Hartford**.—H. W. Ayres, G. M. Bond, W. B. Franklin, E. D. Graves, T. H. McKenzie, E. C. Terry, C. B. Vorce. **Middletown**.—G. H. Bishop. **New Britain**.—C. M. Jarvis. **New Haven**.—C. Blakeslee, J. P. Bogart, A. J. Du Bois, C. A. Ferry, H. H. Gladding, A. B. Hill, A. L. Hyde, C. M. Ingersoll, Jr., C. W. Kelly, W. F. Merrill, W. H. Moore. **New London**.—C. F. Powell. **Norwalk**.—R. Van Buren. **Norwich**.—C. C. Elwell. **Stamford**.—B. D. Greene. **Waterbury**.—W. W. Bonnett, R. A. Cairns.

Associate Members.—**Danbury**.—A. W. Burchard. **Hartford**.—E. W. Bush. **New Haven**.—S. E. Barney, G. A. Lund, C. H. Nichols, W. T. Spencer. **New London**.—A. C. Lewerenz. **South Manchester**.—J. L. Adams. **Stamford**.—L. B. Jenckes. **West Hartford**.—W. E. Johnson.

Associates.—**Middletown**.—E. T. Belden.

Juniors.—**Deep River**.—W. H. Chadbourne, Jr. **Hartford**.—H. R. Buck. **New Haven**.—W. H. Allen, E. E. Minor, E. M. T. Ryder, E. W. Wiggin. **West Haven**.—H. de B. Forbes.

Fellows.—**Waterbury**.—N. J. Welton.

DELAWARE. Total Membership, 7.

Members.—**Newark**.—J. R. Maxwell. **Wilmington**.—T. C. Hatton, T. A. Leisen, W. A. Pratt, G. Tatnall.

Juniors.—**Wilmington**.—G. Rommel, Jr., A. J. Taylor.

DISTRICT OF COLUMBIA. Total Membership, 62.**Honorary Members.**—*Washington*.—G. W. Melville.**Members.**—*Washington*.—F. V. Abbot, S. T. Abert, J. Biddle, W. M. Black, E. Burr, D. S. Carll, A. P. Davis, E. M. Douglas, M. T. Endicott, C. H. Fitch, B. R. Green, W. C. Gunnell, D. J. Howell, C. B. Hunt, W. V. Judson, D. W. Lum, J. L. Lusk, A. Mackenzie, D. E. McComb, C. H. McKinstry, H. L. Marindin, F. O. Maxson, E. Mead, A. M. Miller, A. T. Mosman, F. H. Newell, G. L. Nicolson, R. E. Peary, A. E. Phillips, F. L. Stuart, H. H. Trundle, G. M. Wheeler, H. M. Wilson.**Associate Members.**—*Washington*.—F. L. Averill, C. C. Babb, K. Berle, H. Davis, J. S. Elliott, F. Freyhold, J. H. Hanna, J. F. Hayford, E. A. Hill, F. W. Lepper, H. B. Looker, W. C. Lyon, C. A. McKenney, F. E. Matthes, G. H. Matthes, C. A. Miner, H. A. Pressey, H. H. Rousseau, E. Schmitt, N. B. Sweitzer, W. McG. Wallace, F. C. Warman.**Associates.**—*Washington*.—E. L. Abbott, F. L. Freeman, J. E. Watkins.**Juniors.**—*Washington*.—O. L. Ingalls, F. R. Weller, J. R. Whelpley.**FLORIDA.** Total Membership, 8.**Members.**—*Fernandina*.—J. H. Bacon. *Mayport*.—F. W. Bruce. *Pensacola*.—G. K. McCormick. *St. Augustine*.—L. R. McLain, J. W. Sackett.**Associate Members.**—*Key West*.—J. M. Braxton. *St. Augustine*.—E. B. Thomson. *Tampa*.—G. M. Eldridge.**GEORGIA.** Total Membership, 15.**Members.**—*Atlanta*.—R. M. Clayton, B. M. Hall. *Augusta*.—N. Wingfield. *Bainbridge*.—A. Pew. *Cave Spring*.—J. S. Smith. *Hapeville*.—E. A. Doane. *Savannah*.—G. M. Gadsden, W. W. Hegeman, H. M. Steele. *Vidalia*.—D. B. Dunn.**Associate Members.**—*Athens*.—C. M. Strahan. *Atlanta*.—T. P. Branch. *Savannah*.—J. de B. Kops.**Associates.**—*Atlanta*.—G. H. Crafts, C. E. Hamlin.**HAWAIIAN ISLANDS.** Total Membership, 6.**Members.**—*Honolulu*.—F. J. Amweg, C. H. Snyder, J. T. Taylor, A. S. Tuttle.**Associate Members.**—*Honolulu*.—S. J. Fortin.**Associates.**—*Honolulu*.—R. J. Pratt.**IDAHO.** Total Membership, 5.**Members.**—*Boise*.—D. W. Ross, A. J. Wiley. *Grangeville*.—W. H. Hill. *Pocatello*.—J. Q. Barlow.**Associate Members.**—*Centerville*.—T. G. Janney.**ILLINOIS.** Total Membership, 119.**Members.**—*Champaign*.—I. O. Baker. *Chicago*.—G. Adgate, J. W. Alvord, F. C. H. Arentz, S. G. Artingstall, H. F. Baldwin, O. Bates, E. H. Beckler, C. E. Billin, E. J. Blake, G. H. Boynton, G. H. Bremner, W. M. Camp, D. D.

Carothers, E. C. Carter, O. Chanute, G. B. Christie, J. A. Cole, T. L. Condron, L. E. Cooley, W. L. Cowles, H. S. Crocker, W. W. Curtis, J. Dun, De C. Dunlap, A. R. Eldridge, H. N. Elmer, O. H. Ernst, S. M. Felton, R. Forsyth, J. A. Fulton, H. Gol'dmark, C. A. Hasbrouck, H. E. Horton, C. W. Hotchkiss, W. M. Hughes, R. W. Hunt, J. W. Kendrick, G. A. Lederle, E. H. Lee, J. Lowe, C. F. Loweth, W. A. Lydon, D. MacAllister, C. MacRitchie, A. J. Mason, D. W. Mead, R. Modjeski, J. Nichol, L. A. Nichols, H. W. Parkhurst, A. V. Powell, W. A. Rogers, W. H. Rosenerans, S. McM. Rowe, J. W. Schaub, E. K. Scott, J. A. Seddon, E. C. Shankland, R. M. Shankland, D. Sloan, W. S. Smith, V. K. Spicer, A. C. Stites, C. L. Strobel, F. H. Todd, G. W. Vaughn, J. F. Wallace, C. V. Weston, D. J. Whittemore, P. Willis, A. Ziesing. *East St. Louis*.—H. F. Juengst. *Evanston*.—C. J. Morse. *Galesburg*.—G. J. Bell. *La Grange*.—W. B. Ewing. *Peoria*.—D. H. Maury, Jr. *Pullman*.—A. Twyman. *Quincy*.—E. Prince. *Rock Island*.—A. L. Richards, C. McD. Townsend. *Sterling*.—L. L. Wheeler. *Urbana*.—A. N. Talbot.

Associate Members.—*Anchor*.—C. B. Stewart. *Champaign*.—M. S. Ketchum. *Chicago*.—W. D. Barber, F. G. Frink, A. H. Green, E. McK. Hagar, J. C. Hain, W. J. Harahan, C. L. Keller, R. McCulloch, A. F. Reichmann, E. L. Shaw, W. E. S. Strong, E. E. R. Tratman. *East St. Louis*.—E. G. Helm. *Moline*.—C. L. Crabbs. *Peoria*.—J. A. Harman, C. S. Millard. *Sheffield*.—J. W. Woermann. *Shelbyville*.—C. E. Chester. *Sterling*.—M. G. Barnes, F. W. Honens. *Thebes*.—W. E. Angier.

Associates.—*Chicago*.—C. M. Foster, J. P. Johnston, W. J. Karner, C. F. Quincy, J. H. Warder.

Juniors.—*Chicago*.—M. S. Darrow, C. H. Fuller, M. E. Shire, R. A. Widdicombe. *Springfield*.—C. Millard.

Fellows.—*Chicago*.—E. W. Blatchford, N. S. Bouton, G. C. Walker.

INDIAN TERRITORY. Total Membership, 3.

Members.—*Hartshorne*.—E. J. Beard. *Muscogee*.—H. V. Hinckley.

Associate Members.—*Hartshorne*.—F. Lavis.

INDIANA. Total Membership, 19.

Members.—*Frankfort*.—J. L. Frazier. *Indianapolis*.—C. C. Brown, M. M. Defrees, C. G. Elliott, J. A. McKim, M. W. Mansfield. *Lafayette*.—W. D. Pence. *Logansport*.—F. T. Hatch. *Terre Haute*.—M. A. Howe, B. McKeen. *Washington*.—L. C. Fritch, A. G. Norton.

Associate Members.—*Indianapolis*.—C. A. Paquette, J. G. Spielman, R. P. Woods. *Logansport*.—V. K. Hendricks. *Washington*.—W. B. Poland.

Juniors.—*Indianapolis*.—S. Horton. *Wabash*.—C. E. Howe.

IOWA. Total Membership, 17.

Members.—*Boone*.—A. A. Schenck. *Burlington*.—F. Beckwith. *Cedar Rapids*.—H. F. White. *Council Bluffs*.—C. E. H. Campbell. *Davenport*.—C. Francis. *Des Moines*.—D. H. Ainsworth. *Fort Dodge*.—H. C. Keith. *Iowa City*.—A. V. Sims. *Keokuk*.—M. Meigs. *Sioux City*.—H. M. Chittenden.

Associate Members.—*Ames*.—A. Marston. *Burlington*.—E. A. Steele. *Clinton*.—G. B. Strickler. *Fort Madison*.—H. C. Phillips.
Juniors.—*Ames*.—C. W. J. Neville. *Mason City*.—J. B. Stouder. *Winterset*.—F. G. White.

KANSAS. Total Membership, 9.

Members.—*Lawrence*.—W. McGrath, F. O. Marvin. *Leavenworth*.—E. H. Connor, A. J. Tullock, M. A. Waldo. *Topeka*.—C. A. Morse, A. F. Robinson, W. B. Storey, Jr.

Associate Members.—*Topeka*.—A. G. Allan.

KENTUCKY. Total Membership, 32.

Members.—*Ashland*.—H. Pierce. *Covington*.—G. B. Nicholson. *Crescent Hill*.—R. Fink. *Danville*.—C. Breckinridge. *Earlington*.—J. B. Atkinson. *Irvine*.—A. T. Sabin. *Kuttawa*.—L. Anderson. *Louis*.—D. A. Watt. *Louisville*.—W. H. Courtenay, F. de Funiak, J. A. Fairleigh, C. Hermany, W. E. Hutchings, J. M. Johnson, E. E. Kuersteiner, R. Montfort, M. Morris, T. P. Shanks, G. W. Shaw, J. E. Willard, M. A. Zook.

Associate Members.—*Hopkinsville*.—J. F. Burns. *Lexington*.—J. P. Brooks, C. C. FitzGerald. *Louisville*.—G. MacLeod, J. P. Whiskeman.

Associates.—*Louisville*.—J. B. Speed.

Juniors.—*Louisville*.—R. D. M. Henley.

Fellows.—*Louisville*.—J. W. Ainslie, W. R. Belknap, T. C. Coleman, B. du Pont.

LOUISIANA. Total Membership, 25.

Members.—*Monroe*.—L. W. Stubbs. *New Orleans*.—A. C. Bell, L. W. Brown, J. F. Coleman, A. C. Cunningham, G. McC. Derby, G. G. Earl, W. J. Hardee, B. M. Harrod, F. M. Kerr, S. F. Lewis, A. Perrilliat, H. B. Richardson, W. L. Wilson, W. B. Wright. *Port Eads*.—C. Donovan.

Associate Members.—*Alexandria*.—H. K. Seltzer. *Jeanerette*.—J. R. Downman. *New Orleans*.—J. T. Eastwood, L. E. Lion, W. M. Venable. *Shreveport*.—A. Mayer.

Juniors.—*Alexandria*.—E. E. Howard. *New Orleans*.—J. F. Richardson, G. C. Woppard.

MAINE. Total Membership, 20.

Members.—*Bangor*.—W. Crosby, J. N. Greene. *Boothbay Harbor*.—T. W. Baldwin. *Gardiner*.—F. Danforth, F. E. Hull. *Houlton*.—M. Burpee. *Millinocket*.—H. S. Ferguson. *Orono*.—G. H. Hamlin. *Portland*.—C. C. A. Both, F. S. Burrowes, B. W. Guppy, E. C. Jordan. *Rumford Falls*.—C. A. Mixer. *Wiscasset*.—G. P. Farley.

Associate Members.—*Bangor*.—F. L. Marston. *Millinocket*.—J. W. Tower. *Portland*.—F. W. Kinsey, W. M. Smith, C. P. Williams. *Rockland*.—O. H. Tripp.

MARYLAND. Total Membership, 31.

Members.—*Annapolis*.—G. E. Thomas. *Baltimore*.—K. Allen, M. L. Byers, M. Cohen, E. A. Frink, J. M. Graham, J. E. Greiner, P. C. Hains, F. H. Hambleton, G. B. Hazlehurst, C. A. Hook, N. H. Hutton, W. L. Kenly, C. H. Latrobe, L. F. Lorce, W. T. Manning, T. D. Whistler. *Frostburg*.—B. S. Randolph. *Hagerstown*.—C. McK. Craig, C. O. Vandevanter. *Ruxton*.—J. Fisher.

Associate Members.—*Annapolis*.—J. K. Wilkes. *Baltimore*.—W. R. Edwards, H. S. Farquhar, J. B. Hayden, W. D. Lockwood, A. M. Quick.

Associates.—*Port Deposit*.—A. L. Colsten.

Juniors.—*Baltimore*.—W. H. Ford, C. G. Wells. *Chestertown*.—M. deK. Smith, Jr.

MASSACHUSETTS. Total Membership, 162.

Honorary Members.—*Boston*.—C. S. Storrow.

Members.—*Auburndale*.—W. P. Snow. *Boston*.—C. F. Allen, T. Aspinwall, F. A. Barbour, T. H. Barnes, D. Brackett, W. H. Bradley, F. Brooks, W. M. Brown, A. E. Burton, H. A. Carson, H. H. Carter, A. S. Cheever, J. E. Cheney, E. C. Clarke, F. C. Coffin, A. B. Corthell, F. S. Curtis, R. B. Davis, E. P. Dawley, E. S. Dorr, G. E. Evans, B. R. Felton, D. FitzGerald, J. P. Frizell, F. L. Fuller, E. A. W. Hammatt, E. Harrington, H. W. Hayes, S. C. Heald, F. W. Hodgdon, G. Hodges, E. W. Howe, W. Jackson, G. A. Kimball, W. E. McClintock, H. Manley, F. O. Melcher, H. Mitchell, G. S. Morrill, C. Morton, J. C. Ostrup, W. Parker, W. T. Pierce, A. L. Plimpton, D. Porter, L. F. Rice, A. A. Robinson, J. W. Rollins, Jr., W. Rotch, C. M. Saville, E. Sawyer, R. A. Shailer, J. P. Snow, O. Sonne, F. P. Stearns, G. F. Swain, H. Taylor, L. A. Taylor, S. E. Tinkham, A. T. Tomlinson, L. W. Tucker, E. K. Turner, W. Watson, W. Wheeler, F. O. Whitney, H. B. Wood, C. J. H. Woodbury, J. R. Worcester. *Brookline*.—S. C. Ellis, A. H. French. *Cambridge*.—E. D. Leavitt. *Clinton*.—A. E. Kastl, H. A. Miller, H. Parker, T. F. Richardson, C. E. Wells. *Everett*.—W. W. Cummings. *Forest Hills*.—G. R. Hardy. *Holyoke*.—N. H. Whitten. *Lawrence*.—R. A. Hale, I. L. Sjöström. *Lowell*.—A. T. Safford. *Lynn*.—C. W. Gay. *Malden*.—G. A. Wetherbee. *New Bedford*.—A. B. Drake. *Newton Center*.—D. H. Andrews. *North Adams*.—J. H. Emigh, F. B. Locke. *Somerville*.—W. F. Goodrich. *Springfield*.—G. N. Merrill, M. Moulton, A. B. Paine, C. M. Slocom. *Taunton*.—L. Dean. *Turners Falls*.—C. W. Hazelton. *Wakefield*.—G. M. Tompson. *Westboro*.—E. C. Appleton. *West Medford*.—H. Bissell. *West Newton*.—H. D. Woods. *Weston*.—S. Child. *Worcester*.—C. A. Allen, R. H. Brown, W. E. Buck, D. M. Wheeler, G. H. White.

Associate Members.—*Amherst*.—J. E. Ostrander. *Boston*.—W. M. Bailey, W. T. Barnes, P. C. Barney, E. J. Bengler, J. S. Browne, M. W. Cooley, J. N. Ferguson, A. D. Flinn, J. K. Freitag, X. H. Goodnough, L. E. Hawes, J. L. Howard, C. S. Humphreys, W. S. Johnson, W. C. Lambert, F. P. McKibben, L. Metcalf, J. C. Moses, M. S. Pope, C. W. Sherman, F. H.

Snow, G. E. Stratton, C. F. Taylor, L. C. Wason, R. S. Weston. **Boylston**.—E. H. Baldwin. **Cambridge**.—L. J. Johnson, W. D. Wiggins. **Charlestown**.—J. C. Boyd. **Clinton**.—H. J. Morrison. **Holyoke**.—E. P. Butts, J. L. Tighe. **Malden**.—C. G. Waitt. **Newton Highlands**.—S. E. Thompson. **Quincy**.—P. Lawton. **South Framingham**.—W. W. Locke. **Worcester**.—A. W. French.

Associates.—**Boston**.—H. A. Phillips, J. H. Sawyer. **Springfield**.—H. L. Norton. **Waltham**.—W. Roberts. **Worcester**.—J. M. Goodell.

Juniors.—**Boston**.—G. C. Bartram, J. V. D. Beekman, Jr., E. W. Bowditch, F. H. Fay, A. D. Fuller, A. B. Ilsley, R. Tappan. **Fall River**.—E. I. Marvell. **Worcester**.—H. C. Ives.

Fellows.—**Montague City**.—B. N. Farren. **Orange**.—N. Cheney. **Swampscott**.—S. Holman.

MICHIGAN. Total Membership, 52.

Members.—**Ann Arbor**.—J. B. Davis, C. E. Greene, H. C. Ripley. **Atlantic Mine**.—F. McM. Stanton. **Benton Harbor**.—J. W. Pearl. **Coldwater**.—J. A. Latcha. **Detroit**.—A. B. Atwater, J. W. Beardsley, W. H. Bixby, B. Douglas, W. L. Fisk, E. E. Haskell, J. D. Hawks, D. F. Henry, H. S. Hodge, F. B. Howard, J. C. Hutchins, G. H. Kimball, R. H. McCormick, J. Tuthill, E. S. Wheeler, G. Y. Wisner. **Escanaba**.—C. Palmer. **Grand Rapids**.—C. Keller, F. W. Lehnartz, J. J. McVean, K. S. Riser. **Houghton**.—G. A. Marr. **Jackson**.—R. M. Newman. **Kalamazoo**.—G. S. Pierson. **Lapeer**.—F. Morley. **Manistee**.—E. W. Muenscher. **Marquette**.—H. F. Northrup, H. Seymour. **Newaygo**.—D. McCool. **Sault Ste. Marie**.—J. Ripley.

Associate Members.—**Detroit**.—R. B. Green, C. W. Hubbell. **Grand Rapids**.—G. M. Ames, L. W. Goddard. **Houghton**.—J. F. Jackson. **Lansing**.—H. L. Cleverdon. **Port Huron**.—L. C. Sabin. **Sault Ste. Marie**.—J. H. Brace, G. F. Stickney.

Associates.—**Detroit**.—C. H. Lindenberger. **Saginaw**.—G. L. Burrows.

Juniors.—**Detroit**.—G. H. Fenkell, C. Potts. **St. Joseph**.—J. C. Sesser. **Sault Ste. Marie**.—B. Rohmert. **Traverse City**.—J. F. Wilhelm.

MINNESOTA. Total Membership, 36.

Members.—**Duluth**.—C. Coleman, J. H. Darling, F. E. House, D. A. Reed. **Freeburg**.—J. Till. **Minneapolis**.—F. W. Cappelen, W. de la Barre, J. T. Fanning, L. S. Gillette, O. Hoff, H. G. Kelley, C. H. Prior, H. E. Stevens, C. A. P. Turner. **St. Paul**.—R. B. C. Bement, O. Claussen, W. L. Darling, R. L. Hoxie, G. H. Hutchinson, E. H. McHenry, C. J. A. Morris, A. W. Münster, A. O. Powell, L. W. Rundlett, D. C. Shepard, W. C. Smith, J. F. Stevens, G. L. Wilson. **Willmar**.—E. W. Lewis. **Winona**.—W. Beahan.

Associate Members.—**Minneapolis**.—A. C. Bell, F. H. Constant, F. M. Henry.

St. Paul.—F. R. Coates, M. Toltz.

Fellows.—**St. Paul**.—J. J. Hill.

MISSISSIPPI. Total Membership, 9.

Members.—*Greenville*.—A. Hider, R. Somerville. *Jackson*.—W. G. Kirkpatrick. *Natchez*.—E. B. Geddes, C. W. Walton. *Vicksburg*.—H. M. Marshall, C. W. Sturtevant.

Associate Members.—*Greenville*.—S. Archer, Jr., A. M. Todd.

MISSOURI. Total Membership, 74.

Members.—*Columbia*.—F. P. Spalding. *Jefferson City*.—S. W. Fox. *Kansas City*.—D. Bontecou, A. L. Dabney, H. H. Filley, I. G. Hedrick, J. W. Hoover, W. Kiersted, R. J. McCarty, A. Maitland, Jr., M. P. Paret, G. W. Pearsons, A. A. Trocon, J. A. L. Waddell, R. W. Waddell. *Kirkwood*.—H. W. Baker. *Mine La Motte*.—C. F. Stephens. *St. Joseph*.—J. F. Barnard, B. L. Crosby. *St. Louis*.—F. W. Abbot, A. H. Blaisdell, J. L. Campbell, B. H. Colby, C. L. Fitch, E. Flad, C. Gayler, L. F. Goodale, E. A. Hermann, M. L. Holman, J. R. Hudson, A. L. Johnson, C. H. Ledlie, E. D. Libby, W. S. Lincoln, F. J. Llewellyn, R. E. McMath, C. V. Mercereau, R. Moore, J. A. Ockerson, H. Phillips, C. de la C. Purdon, J. Ramsey, Jr., S. B. Russell, H. P. Taussig, J. L. Van Ornum, R. L. Van Sant, J. W. Way.

Associate Members.—*Crystal City*.—R. K. Brown, Jr. *Kansas City*.—C. S. Burns, R. Morey. *Old Orchard*.—J. I. Boggs. *Pacific*.—L. Highley. *Rolla*.—E. J. McCaustland. *St. Louis*.—O. W. Childs, B. Cole, E. B. Fay, J. T. Garrett, R. P. Garrett, C. Hill, F. T. Llewellyn, O. E. Mogensen, H. J. Pfeifer, A. H. Zeller. *Springfield*.—J. V. Hanna.

Associates.—*St. Louis*.—H. Elliott.

Juniors.—*Kansas City*.—J. W. Barriger, Jr., W. E. Pruett, W. H. Starr. *St. Louis*.—J. B. Cameron, H. E. Grimm, W. A. Tyrrell. *Sedalia*.—J. W. Skelly. *Spring Garden*.—H. F. Taylor.

Fellows.—*St. Louis*.—E. W. Coit.

MONTANA. Total Membership, 11.

Members.—*Bozeman*.—E. C. Kinney. *Butte*.—E. Carroll, E. H. Wilson. *Harlem*.—A. E. Cumming. *Jennings*.—M. E. Reed. *Virginia City*.—J. Baier.

Associate Members.—*Butte*.—C. D. Vail. *Helena*.—M. H. Gerry, Jr. *Red Bluff*.—G. D. B. Turner.

Juniors.—*Gebo*.—H. McLeod. *Jennings*.—C. N. Kast.

NEBRASKA. Total Membership, 5.

Members.—*Omaha*.—W. A. Ayerigg, G. T. Prince, A. Rosewater. *South Omaha*.—W. S. King.

Associate Members.—*Omaha*.—A. C. Koenig.

NEW HAMPSHIRE. Total Membership, 7.

Members.—*Little Boar's Head*.—W. H. Jaques. *Manchester*.—H. A. Herrick. *Portsmouth*.—L. Treadwell.

Associate Members.—*Laconia*.—W. Nelson.

Associates.—*Hanover*.—R. Fletcher, J. V. Hazen.

Juniors.—*Hanover*.—J. L. Mann.

NEW JERSEY. Total Membership, 76.

Members.—*Ampere*.—S. S. Wheeler. *Bayonne*.—F. H. Baldwin. *Bound Brook*.—H. M. Herbert. *Bridgeton*.—O. Smith. *Camden*.—H. C. Felton, DeC. May, H. G. Morse. *Edison*.—O. Benson. *Flanders*.—C. G. Force. *Glenridge*.—A. H. Tyson. *Hoboken*.—T. H. McCann. *Jersey City*.—M. L. Gardner, E. W. Harrison, J. O. Osgood. *Manasquan*.—T. Appleton. *Newark*.—W. P. Field, S. W. Hayes, H. A. Hickok, G. Lehlbach, J. Owen, M. R. Sherrerd, E. Vanderpool. *Passaic*.—E. LeB. Gardiner, M. R. Strong. *Paterson*.—G. H. Blakeley, J. W. Smith. *Perth Amboy*.—G. Devin. *Plainfield*.—R. W. Ware. *Princeton*.—C. McMillan. *South Orange*.—J. B. Duncklee. *Summit*.—C. P. Bassett. *Trenton*.—C. Fisher, C. E. Hewitt, E. G. Spilsbury.

Associate Members.—*Atlantic City*.—W. C. Hawley. *Elizabeth*.—C. P. Bonnett, W. H. Luster, Jr. *Hoboken*.—F. Rosenberg, W. F. Whittemore. *Jersey City*.—F. E. Ferris, N. D. Wortendyke. *Maurer*.—W. A. Allen. *Morristown*.—F. V. Pitney. *Newark*.—C. E. Davis, C. A. Mead, H. H. Mitchell. *Orange*.—P. R. MacNeille. *Paterson*.—J. H. Cook, A. W. Cuddeback, G. G. Honness. *Red Bank*.—T. H. Grant. *South Orange*.—W. B. Yereance. *Rahway*.—L. Focht. *Vailsburg*.—W. T. Lyle.

Associates.—*Bound Brook*.—J. I. Livingston. *Newark*.—L. F. Braine. *Princeton*.—H. S. S. Smith, F. N. Willson.

Juniors.—*Atlantic City*.—C. J. Myers. *Bogota*.—St. J. Clarke. *Boonton*.—G. H. Bouton. *East Orange*.—J. A. Clark, Jr. *Elizabethport*.—M. Far-gusson. *Jersey City*.—J. C. Anderson, De F. H. Dixon, A. Hamill, Jr., J. M. Towne. *Mendham*.—J. S. Stiger, Jr. *Newark*.—H. G. Harrington, G. E. J. Pistor. *Paterson*.—H. S. Speidel, G. E. Tilt. *Princeton*.—H. A. Harris. *Ridgewood*.—R. T. Dana.

Fellows.—*Bound Brook*.—W. J. Taylor. *Paterson*.—J. Watson.

NEW MEXICO Total Membership, 7.

Members.—*Alamogordo*.—H. A. Sumner. *Albuquerque*.—P. E. Harroun. *East Las Vegas*.—E. W. Grant, M. S. Parker. *Las Vegas*.—J. F. Flagg. *Magdalena*.—A. B. Fitch.

Juniors.—*San Pedro*.—R. S. McCaffery.

NEW YORK. Total Membership, 728.

Honorary Members.—*Brooklyn*.—T. F. Rowland

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H. A. La Chicotte, W. B. Lee, G. Leverich, N. P. Lewis, C. C. Martin, O. F. Nichols, G. W. Plympton, S. R. Probasco, C. B. Rowland, C. L. Rowland, T. F. Rowland, Jr., C. W. Staniford, J. Strachan, G. A. Tibbals, S. G. Tibbals, G. W. Tillson. **Buffalo.**—F. V. E. Bardol, G. B. Bassett, G. S. Field, S. J. Fields, G. S. Gatehell, E. B. Guthrie, W. A. Haven, E. Hayes, S. T. M. B. Kielland, L. H. Knapp, E. Low, T. McKeown, C. M. Morse, J. C. Quintus, G. A. Ricker, T. G. Smith, T. W. Symons, C. H. Tutton, J. Van der Hoek, E. F. Van Hoesen, G. W. Vaughan, O. F. Whitford. **Catskill.**—C. H. Van Orden. **Cherry Valley.**—A. B. Cox. **Cohoes.**—E. Hayes. **Constableville.**—C. Constable. **Croton-on-Hudson.**—J. Breuchaud. **Dansville.**—E. T. Scovill. **Dunkirk.**—C. E. Hequembourg. **Elmira.**—E. E. Buchanan. **Fishkill.**—O. W. Barnes. **Flushing.**—G. A. Roullier. **Geneseo.**—J. Young. **Geneva.**—C. T. Church. **Glens Falls.**—W. W. Maclay. **Groton.**—E. A. Landon. **Hempstead.**—L. R. Clapp. **Irvington-on-Hudson.**—W. Katté. **Islip.**—E. R. Smith. **Ithaca.**—C. L. Crandall, E. A. Fuertes, R. H. Thurston, G. S. Williams. **Jamaica.**—R. Evans, J. J. McLaughlin. **Jamestown.**—E. C. Burns. **Katonah.**—E. Wegmann. **Kingston.**—E. B. Codwise, W. G. Price. **Linoleumville.**—D. N. Melvin. **Long Island City.**—L. C. L. Smith. **Middletown.**—E. Canfield. **New Brighton.**—H. P. Morrison. **Newburgh.**—E. Garrison, J. D. Van Buren. **New Rochelle.**—H. Crosby. **New York City.**—C. H. Allen, W. S. Auchincloss, G. Aus, H. N. Babcock, W. E. Baker, W. J. Baldwin, C. B. Ball, G. S. Baxter, R. J. Beach, W. E. Belknap, J. A. Bensel, L. DeC. Berg, W. G. Berg, R. M. Berrian, J. Bogart, V. G. Bogue, A. P. Boller, R. P. Bolton, A. L. Bowman, G. W. Bramwell, J. A. Briggs, A. G. Brinckerhoff, H. W. Brinckerhoff, T. E. Brown, C. W. Buchholz, R. S. Buck, G. B. Burbank, W. H. Burr, H. M. Byllesby, G. W. Catt, W. A. Cattell, F. L. Chase, J. E. Childs, A. Coffin, T. A. Coffin, H. J. Cole, F. Collingwood, D. C. N. Collins, C. B. Comstock, H. Constable, C. H. Cooke, T. Cooper, G. B. Cornell, A. Craven, R. W. Creuzbaur, J. J. R. Croes, F. Crowell, J. V. Davies, C. Davis, C. B. Davis, C. H. Davis, J. P. Davis, S. L. F. Deyo, H. F. Dunham, E. Duryea, Jr., E. W. Eckert, O. Erlandsen, L. H. Evans, H. H. Farnum, J. W. Ferguson, F. D. Fisher, J. D. Fouquet, A. Fteley, J. H. Fuertes, W. B. Fuller, M. Gay, G. Gibbs, G. E. Gifford, C. H. Graham, E. A. Greene, F. V. Greene, G. S. Greene, Jr., E. Griffin, C. A. Hagne, S. S. Haight, H. S. Haines, W. G. Hamilton, C. Hansel, G. E. Harding, W. J. Haskins, C. H. Haswell, A. Haviland, R. S. Hayes, A. Hazen, C. W. Hendrick, R. Hering, C. Herschel, W. Hildenbrand, G. Hill, W. R. Hill, A. L. A. Himmelwright, S. W. Hoag, Jr., H. W. Hodge, N. B. K. Hoffman, R. H. Hood, D. L. Hough, H. J. Howe, A. C. Humphreys, C. W. Hunt, G. A. Just, G. Kaufman, G. T. Keith, W. D. Kelley, W. W. Kenly, P. S. King, T. P. Kinsley, E. Klapp, J. M. Knap, W. H. Knight, J. Langton, S. H. Lea, F. McD. Leavitt, M. Lewinson, J. W. Lieb, Jr., G. Lindenthal, J. A. Lockwood, T. J. Long, H. Loomis, A. Lucius, J. Lundie, C. Macdonald, J. E. McKay, A. R. McKim, T. J. McMinn, J. A. McNicol, G. W. McNulty, H. H. Marden, Jr., W. Martin, J. Mayer, A. G. Menocal, W. C. Merryman, T. C. Meyer, H. C. Miller, S. Miller, C. H. Moore,

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NORTH CAROLINA. Total Membership, 9.

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NORWAY	1
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SPAIN	1
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WILLIAM JARVIS MCALPINE,* August 5, 1868, to November 3, 1869.
ALFRED WINGATE CRAVEN,* November 3, 1869, to November 1, 1871.
HORATIO ALLEN,* November 1, 1871, to November 5, 1873.
JULIUS WALKER ADAMS,* November 5, 1873, to November 3, 1875.
GEORGE SEARS GREENE,* November 3, 1875, to November 7, 1877.
ELLIS SYLVESTER CHESBROUGH,* November 7, 1877, to November 6, 1878.
WILLIAM MILNOR ROBERTS,* November 6, 1878, to November 5, 1879.
ALBERT FINK,* November 5, 1879, to November 3, 1880.
JAMES BICHENO FRANCIS,* November 3, 1880, to January 18, 1882.
ASHBEL WELCH,* January 18, 1882, to September 25, 1882.†
CHARLES PAINE, January 17, 1883, to January 16, 1884.
DON JUAN WHITEMORE, January 16, 1884, to January 21, 1885.
FREDERIC GRAFF,* January 21, 1885, to January 20, 1886.
HENRY FLAD,* January 20, 1886, to January 19, 1887.
WILLIAM EZRA WORTHEN,* January 19, 1887, to January 18, 1888.
THOMAS COLTRIN KEEFER, January 18, 1888, to January 16, 1889.
MAX JOSEPH BECKER,* January 16, 1889, to January 15, 1890.
WILLIAM POWELL SHINN,* January 15, 1890, to January 21, 1891.
OCTAVER CHANUTE, January 21, 1891, to January 20, 1892.
MENDES COHEN, January 20, 1892, to January 18, 1893.
WILLIAM METCALF, January 18, 1893, to January 17, 1894.
WILLIAM PRICE CRAIGHILL,‡ January 17, 1894, to January 16, 1895.
GEORGE SHATTUCK MORISON, January 16, 1895, to January 15, 1896.
THOMAS CURTIS CLARKE,* January 15, 1896, to January 20, 1897.
BENJAMIN MORGAN HARROD, January 20, 1897, to January 19, 1898.
ALPHONSE FTELEY, January 19, 1898, to January 18, 1899.
DESMOND FITZGERALD, January 18, 1899, to January 17, 1900.
JOHN FINDLEY WALLACE, January 17, 1900, to January 16, 1901.
JOHN JAMES ROBERTSON CROES, January 16, 1901, to January 15, 1902.
ROBERT MOORE, January 15, 1902.

VICE-PRESIDENTS.

EDWARD GARDINER,* November 5, 1852, to November 2, 1853.
CHARLES W. COPELAND,* November 5, 1852, to November 3, 1869.
ALFRED WINGATE CRAVEN,* November 2, 1853, to November 6, 1867.
JULIUS WALKER ADAMS,* November 6, 1867, to November 5, 1873.
JAMES BICHENO FRANCIS,* November 3, 1869, to November 2, 1870, and November 6, 1878, to November 3, 1880.
THOMAS CURTIS CLARKE,* November 2, 1870, to November 1, 1871.

* Deceased.

† Mr. Ashbel Welch died September 25, 1882, during his term of office as President.

‡ Elected President during term of office as Director.

VICE-PRESIDENTS—(Continued).

- JACOB MERRILL CLARK,* November 1, 1871, to November 5, 1873.
 WILLIAM MILNOR ROBERTS,* November 5, 1873, to November 1, 1876, and November 7, 1877, to November 6, 1878.
 THEODORE GRENVILLE ELLIS,* November 5, 1873, to November 7, 1877.
 ALEXANDER LYMAN HOLLEY,* November 1, 1876, to November 7, 1877.
 ALBERT FINK,* November 7, 1877, to November 5, 1879.
 OCTAVE CHANUTE, November 5, 1879, to January 18, 1882.
 ASHBEL WELCH,* November 3, 1880, to January 18, 1882.
 WILLIAM H. PAINE,* January 18, 1882, to January 21, 1885.
 JAMES BUCHANAN EADS,* January 18, 1882, to January 17, 1883.
 HENRY FLAD,* January 17, 1883, to January 16, 1884.
 JOSEPH PHINEAS DAVIS, January 16, 1884, to January 21, 1885.
 GEORGE SEARS GREENE, Jr., January 21, 1885, to January 20, 1886.
 THOMAS JEFFERSON WHITMAN,* January 21, 1885, to January 20, 1886.
 THOMAS COLTRIN KEEFER, January 20, 1886, to January 18, 1888.
 THOMAS FITCH ROWLAND, January 20, 1886, to January 18, 1888.
 J. JAMES ROBERTSON CROES, January 18, 1888, to January 16, 1889.
 ROBERT MOORE, January 18, 1888, to January 16, 1889, and January 18, 1899, to January 16, 1901.
 ALPHONSE FTELEY, January 16, 1889, to January 20, 1892.
 ELMER LAWRENCE CORHELL, January 16, 1889, to January 15, 1890, and January 18, 1893, to January 16, 1895.
 MENDES COHEN, January 15, 1890, to January 21, 1891.
 CHARLES HERMANY, January 21, 1891, to January 20, 1892.
 CHARLES BENJAMIN BRUSH,* January 20, 1892, to January 17, 1894.
 SAMUEL WHINEY, January 20, 1892, to January 17, 1894.
 SAMUEL MERRILL GRAY, January 20, 1892, to January 18, 1893.
 JOHN MACLEOD,* January 20, 1892, to January 18, 1893.
 CHARLES MACDONALD, January 18, 1893, to January 16, 1895.
 CHARLES CYRIL MARTIN, January 17, 1894, to January 15, 1896.
 JOSEPH MILLER WILSON, January 17, 1894, to January 15, 1896.
 DESMOND FITZGERALD, January 16, 1895, to January 20, 1897.
 BENJAMIN MORGAN HARROD, January 16, 1895, to January 20, 1897.
 WILLIAM RICH HUTTON,* January 15, 1896, to January 19, 1898.
 P. ALEXANDER PETERSON, January 15, 1896, to January 19, 1898.
 GEORGE HENRY MENDELL, January 20, 1897, to January 18, 1899.
 JOHN FINDLEY WALLACE, January 20, 1897, to January 18, 1899.
 EDWARD P. NORTH, January 19, 1898, to January 17, 1900.
 FREDERIC P. STEARNS, January 19, 1898, to January 17, 1900.
 ROBERT CARTWRIGHT, January 18, 1899, to January 16, 1901.
 RUDOLPH HERING, January 17, 1900, to January 15, 1902.
 ALFRED NOBLE, January 17, 1900, to January 15, 1902.
 HENRY S. HAINES, January 16, 1901.
 GEORGE H. BENZENBERG, January 16, 1901.
 CHARLES C. SCHNEIDER, January 15, 1902.
 JOHN R. FREEMAN, January 15, 1902.

* Deceased.

SECRETARIES.

ROBERT B. GORSUCH,† November 5, 1852, to November 2, 1853.
 EDWARD GARDINER,* November 2, 1853, to December 1, 1854.
 JAMES OTIS MORSE,* December 1, 1854, to November 3, 1869.
 THOMAS C. MEYER, November 3, 1869, to January 5, 1870.
 ALFRED PANCOAST BOLLER, January 5, 1870, to November 1, 1871.
 GABRIEL LEVERICH, November 1, 1871, to November 7, 1877.
 JOHN BOGART, November 7, 1877, to January 21, 1891.
 FRANCIS COLLINGWOOD, January 21, 1891, to February 5, 1895.
 CHARLES WARREN HUNT, February 5, 1895.

TREASURERS.

ROBERT B. GORSUCH,† November 5, 1852, to November 2, 1853.
 EDWARD GARDINER,* November 2, 1853, to December 1, 1854.
 JAMES O. MORSE,* December 1, 1854, to November 3, 1875.
 JOHN BOGART, November 3, 1875, to November 7, 1877, and January 21, 1891, to January 16, 1895.
 J. JAMES ROBERTSON CROES, November 7, 1877, to January 18, 1888.
 GEORGE SEARS GREENE, Jr., January 18, 1888, to January 21, 1891.
 JOHN THOMSON, January 16, 1895, to January 17, 1900.
 JOSEPH M. KNAP, January 17, 1900.

DIRECTORS.

W. H. MORELL,*	year beginning November,	1852.
W. H. SIDELL,*	" " "	1852.
JULIUS W. ADAMS,*	years "	1852, 1875.
JAMES P. KIRKWOOD,*	"	1852, to Nov., 1867.
ALFRED W. CRAVEN,*	years beginning November,	1852, 1867, 1868, 1871 and 1872.
WILLIAM J. McALPINE,*	years beginning Nov.,	1853, to Nov., 1867, and Nov., 1869.
WILLIAM H. TALCOTT,*	" " "	1853, to Nov., 1868.
JAMES O. MORSE,*	year beginning Nov.,	1853, to Nov., 1867, and Nov., 1876.
J. W. PRATT,*	" " "	1853.
I. C. CHESBROUGH,†	" " "	1854, to Nov., 1867.
JAMES K. FORD,†	" " "	1867, 1868.
GEORGE SEARS GREENE,*	" " "	1867, 1868, 1870, 1872, 1874, 1876, 1877, 1878.
JOHN F. WARD,†	" " "	1867, 1868, 1869, 1870, 1871.
E. S. CHESBROUGH,*	" " "	1869.
THOMAS PROSSER,*	" " "	1869.
JACOB M. CLARK,*	" " "	1869, 1870.
THOMAS F. ROWLAND,	" " "	1870, 1871, 1872.
CHARLES MACDONALD,	" " "	1870, 1873, 1874.
ALFRED P. BOLLER,	" " "	1871.
WILLIAM E. WORTHEN,*	" " "	1871.
JOHN BOGART,	" " "	1872, 1873, 1874.
F. COLLINGWOOD,	" " "	1872, 1873, 1874, 1875.

* Deceased.

† Resigned.

DIRECTORS—(Continued).

DE VOLSON WOOD, †	year beginning Nov., 1873.
O. CHANUTE,	" " " 1873, 1874, 1875, Jan., 1885.
A. L. HOLLEY, *	" " " 1875.
Q. A. GILLMORE, *	" " " 1875.
W. MILNOR ROBERTS, *	" " " 1876.
J. JAMES R. CROES,	" " " 1876.
WILLIAM H. PAINE, *	" " " 1876, 1877, 1878, 1879, 1880.
M. N. FORNEY, †	" " " 1876.
JOSEPH P. DAVIS,	" " " 1877, 1880, Jan., 1882, 1883.
C. SHALER SMITH, *	" " " 1877.
C. VANDERVOORT SMITH, *	" " " 1877, 1878, 1879, 1880.
THOMAS C. CLARKE, *	" " " 1878.
THEODORE G. ELLIS, *	" " " 1878.
CHARLES HERMANY,	" " " 1879.
EDGAR B. VAN WINKLE,	" " " 1879.
GOUVERNEUR K. WARREN, †	" " " 1879.
G. BOUSCAREN,	" " " 1880.
D. J. WHITTEMORE,	" " " 1880.
THOMAS C. KEEPER,	" Jan., 1882.
THOMAS L. CASEY, †	" " 1882.
G. S. GREENE, Jr.,	" " 1882, 1883, 1884, 1886.
GEORGE W. DRESSER, *	" " " 1882.
WILLIAM METCALF,	" " " 1883, 1884.
WILLIAM E. MERRILL, *	" " " 1883.
WILLIAM G. HAMILTON,	" " " 1883, 1887.
THEODORE COOPER,	" " " 1884, 1885.
FREDERIC GRAFF, *	" Nov., 1884.
WILLIAM R. HUTTON, *	" " " 1884, 1885, 1886.
WALTER KATTÉ,	" " " 1885, 1889.
F. W. VAUGHAN, *	" Jan., 1885.
W. HOWARD WHITE, *	" " " 1886.
HENRY G. MORRIS,	" " " 1886.
CHARLES L. STROBEL, †	" " " 1886, 1894.
CHARLES C. SCHNEIDER,	" " " 1887, 1898, 1899, 1900.
STEVENSON TOWLE,	" " " 1887, 1888.
JAMES ARCHBALD,	" " " 1887.
ROBERT FORSYTH,	" " " 1887.
MENDES COHEN,	" " " 1888.
JOSEPH M. WILSON,	" " " 1888.
CHARLES B. BRUSH, *	" " " 1888, 1889, 1890, 1891.
ALPHONSE FTELEY,	" " " 1888.
ELIOT C. CLARKE,	" " " 1889.
ROBERT E. McMATH,	" " " 1889.
WILLIAM P. SHINN, *	" " " 1889.

* Deceased.

† Resigned.

‡ Elected Director to fill the vacancy caused by the death on February 9, 1894, of Abraham Gottlieb.

DIRECTORS—(Continued).

THEODORE VOORHEES,	year beginning Jan., 1890.
ROBERT VAN BUREN,	" " " 1890.
WILLIAM LUDLOW,*	" " " 1890.
WILLIAM G. CURTIS,*	" " " 1890.
RUDOLPH HERRING,	" " " 1891, 1897, 1898, 1899.
CLEMENS HERSCHEL,	" " " 1891.
EDWARD P. NORTH,	" " " 1891.
S. WHINERY,	" " " 1891, 1899, 1900, 1901.
LEFFERT L. BUCK,	" " " 1892, 1893, 1894.
WM. P. CRAIGHILL, [†]	" " " 1892, 1893.
DESMOND FITZGERALD,	" " " 1892, 1893, 1894.
ABRAHAM GOTTLIEB,*	" " " 1892, 1893.
BENJAMIN M. HARROD,	" " " 1892, 1893, 1894.
JOHN THOMSON,	" " " 1892, 1893, 1894.
THEODORE N. ELY,	" " " 1892, 1893.
GEORGE W. McNULTY,	" " " 1892, 1893.
ROBERT MOORE,	" " " 1892, 1893.
O. F. NICHOLS,	" " " 1892, 1893.
P. ALEX. PETERSON,	" " " 1892, 1893.
ROBERT L. READ,	" " " 1892, 1893.
E. A. FUERTES,	" " " 1892.
ALBERT B. HILL,	" " " 1892.
CHARLES H. MYERS,	" " " 1892.
E. T. D. MYERS,	" " " 1892.
JAMES D. SCHUYLER,	" " " 1892, 1899, 1900, 1901.
JOHN G. VAN HORNE,	" " " 1892.
FOSTER CROWELL,	" " " 1893, 1894, 1895.
HENRY G. PROUT,	" " " 1893, 1894, 1895.
WILLARD S. POPE,*	" " " 1893, 1894, 1895.
FREDERIC P. STEARNS,	" " " 1893, 1894, 1895.
JOHN T. FANNING,	" " " 1893, 1894, 1895.
OLIN H. LANDRETH,	" " " 1893, 1894, 1895.
WILLIAM H. BURR,	" " " 1894, 1895, 1896.
BERNARD R. GREEN,	" " " 1894, 1895, 1896.
Sir CASIMIR S. GZOWSKI,* [†]	" " " 1894.
JOSEPH M. KNAP,	" " " 1894, 1895, 1896.
T. GUILFORD SMITH,	" " " 1894, 1895, 1896.
ROBERT B. STANTON,	" " " 1894, 1895, 1896.
HENRY D. WHITCOMB,	" " " 1894, 1895, 1896.
AUGUSTUS MORDECAI,	" " " 1895, 1896, 1897.
CHARLES SOOYSMITH,	" " " 1895, 1896, 1897.
GEORGE H. BENZENBERG,	" " " 1895, 1896, 1897.
GEORGE H. BROWNE,	" " " 1895, 1896, 1897.
ROBERT CARTWRIGHT,	" " " 1895, 1896, 1897.

* Deceased.

† Elected Director to fill the unexpired term of Wm. P. Craighill, who was elected President, January 17, 1894.

‡ Elected President during his term of office as Director.

DIRECTORS—(Continued).

FAYETTE S. CURTIS,	year beginning Jan.,	1895, 1896, 1897.
ALFRED NOBLE, †	" "	" 1895.
GEORGE A. JUST,	" "	" 1896, 1897, 1898.
WILLIAM BARCLAY PARSONS,	" "	" 1896, 1897, 1898.
HORACE SEE,	" "	" 1896, 1897, 1898.
JOHN R. FREEMAN,	" "	" 1896, 1897, 1898.
DANIEL BONTECOU,	" "	" 1896, 1897, 1898.
THOMAS W. SYMONS.	" "	" 1896, 1897, 1898.
JAMES OWEN,	" "	" 1897, 1898, 1899.
BENJAMIN L. CROSBY,	" "	" 1897, 1898, 1899.
HENRY S. HAINES,	" "	" 1897, 1898, 1899.
LORENZO M. JOHNSON,	" "	" 1897, 1898, 1899.
HENRY G. MORSE,	" "	" 1897, 1898, 1899.
S. L. F. DEYO,	" "	" 1898, 1899, 1900.
JOHN KENNEDY,	" "	" 1898, 1899, 1900.
HENRY MANLEY,	" "	" 1898, 1899, 1900.
JOHN J. MCVEAN,	" "	" 1898, 1899, 1900.
GEORGE Y. WISNER,	" "	" 1898, 1899, 1900.
JOHN A. BENSEL,	" "	" 1899, 1900, 1901.
C. W. BUCHHOLZ,	" "	" 1899, 1900, 1901.
EDMUND K. TURNER,	" "	" 1899, 1900, 1901.
PALMER C. RICKETTS,	" "	" 1899, 1900, 1901.
JOHN F. O'ROURKE,	" "	" 1900, 1901, 1902.
HENRY B. SEAMAN,	" "	" 1900, 1901, 1902.
THOMAS H. JOHNSON,	" "	" 1900, 1901, 1902.
JOSEPH RAMSEY, JR.,	" "	" 1900, 1901, 1902.
HENRY B. RICHARDSON,	" "	" 1900, 1901, 1902.
GEORGE A. QUINLAN,*	" "	" 1900, 1901.
JOSIAH A. BRIGGS,	" "	" 1901, 1902.
GEORGE F. SWAIN,	" "	" 1901, 1902.
EMIL KUICHLING,	" "	" 1901, 1902.
MORDECAI T. ENDICOTT,	" "	" 1901, 1902.
EDWARD C. CARTER,	" "	" 1901, 1902.
FRANK C. OSBORN,	" "	" 1901, 1902.
WILLIAM H. KENNEDY,†	" "	" 1902.
RICHARD S. BUCK,	" "	" 1902.
GEORGE H. PEGRAM,	" "	" 1902.
WILLIAM J. WILGUS,	" "	" 1902.
WILLIAM JACKSON,	" "	" 1902.
EDMUND F. VAN HOESEN,	" "	" 1902.
JAMES L. FRAZIER,	" "	" 1902.

* Deceased.

† Elected Director, November 5, 1895, to fill the vacancy caused by the death of Willard S. Pope.

‡ Elected Director, December 3, 1901, to fill the vacancy caused by the death of George A. Quinlan.

DECEASED MEMBERS.

H. M., Honorary Member.

M., Member.

A., Associate.

A. M., Associate Member.

J., Junior.

F., Fellow.

Name.	Date of Election.	Date of Death.	Memoirs.*
ABERT, JOHN JAMES	H. M. Mar. 2, 1853.	Jan. 27, 1862.	XIX, 88
ABBOTT, JOB	M. April 1, 1891.	Aug. 18, 1896. <i>XXXVII</i> , 538	
ACKENHEIL, CHARLES	M. Feb. 2, 1887.	Jun. 20, 1890.	XVII, 137
ADAMS, JULIUS WALKER	{ M. Nov. 5, 1852. H. M. Oct. 26, 1888.	Dec. 13, 1899.	.....
AINSLIE, GEORGE	F. May 28, 1872.	Sept. 6, 1878.	XV, 41
ALDRICH, JAMES COLWELL	M. May 7, 1873.	April 3, 1900.	<i>XLIV</i> , 617
ALLAIRE, WILLIAM MILLER	J. Mar. 2, 1881.	Dec. 14, 1884.	XIX, 67
ALLEN, HORATIO	{ M. Dec. 4, 1867. H. M. Mar. 4, 1874.	Dec. 31, 1889.	XVI, 180
ALLEN, THEODORE	M. Nov. 16, 1870.	Sept. 18, 1890.	XVII, 240
ALLEN, WILLIAM ALBERT	M. May 6, 1891.	Mar. 21, 1896. <i>XXXVI</i> , 539	
ALLIS, EDWARD PHELPS	F. Aug. 4, 1883.	April 1, 1889.	XV, 168
ANDERSON, ADNA	M. Sept. 2, 1874.	May 15, 1889.	XV, 166
ANSLEY, GEORGE DOANE	M. Sept. 4, 1878.	Sept. 22, 1883.	XV, 109
ARTHUR, WILLIAM YOUNG	{ M. Dec. 4, 1867. F. Sept. 20, 1870.	Feb. 15, 1876.	.....
ASPINWALL, WILLIAM HOWLAND	F. July 9, 1870.	Jan. 18, 1875. <i>XXXVI</i> , 598	
ATWOOD, WILLIAM HENRY	M. May 4, 1881.	Sept. 4, 1890.	XVII, 205
AVERY, JOHN	M. Dec. 4, 1867.	Jan. 30, 1884.	XI, 117
BACHE, ALEXANDER DALLAS	H. M. Mar. 2, 1853.	Feb. 17, 1867. <i>XXXVI</i> , 522	
BAILEY, THOMAS NORTON	M. Nov. 7, 1883.	April 20, 1886.	XVI, 186
BAKER, WILLIAM LATIMER	{ J. Jan. 6, 1875. M. Nov. 6, 1878.	May 28, 1888.	XV, 111
BANNISTER, CHARLES KIMBALL	M. May 3, 1893.	Jan. 10, 1901.	.....
BARBOUR, WILLIAM SULLIVAN	M. April 17, 1872.	Feb. 24, 1889.	XV, 142
BARNARD, JOHN GROSS	{ M. Sept. 5, 1869. H. M. April 7, 1873.	May 14, 1882.	XIII, 134
BARNES, DAVID LEONARD	M. July 2, 1890.	Dec. 15, 1896. <i>XLI</i> , 618	
BARNES, JAMES	M. Mar. 13, 1853.	Feb. 12, 1869. <i>XXXVI</i> , 540	
BARTLETT, WINTHROP	M. Jan. 2, 1889.	Jan. 16, 1899.	.....
BATTERSON, JAMES GOODWIN	F. June 7, 1876.	Sept. 18, 1901.	.....
BAUMANN, EDWARD	A. June 2, 1880.	Jan. 26, 1889.	XV, 114
BAILEY, GEORGE WILLIAM READ	M. July 10, 1872.	Dec. 14, 1876.	IV, 58
BEARDSLEY, FRANK CHESTER	M. Nov. 7, 1894.	July 1, 1895.	XXI, 182
BECKER, MAX JOSEPH	M. Aug. 7, 1872.	Aug. 23, 1896. <i>XXXVII</i> , 555	

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Name.	Date of Election.	Date of Death.	Memoirs.*	
BEHRENS, WILLIAM FREDERIC	J. Nov. 6, 1889.	Feb. 6, 1894.	XX, 87	
BELEKNAP, MORRIS SHEPPARD	{ A. M. June 7, 1893.	{ July 19, 1890.	XVI, 167	
BELL, JAMES E.	M. Aug. 7, 1872.	June 9, 1879.	V, 98	
BENTLEY, HENRY ADAMSON	M. Mar. 5, 1879.	May 13, 1889.	.....
BENYAURD, WILLIAM H. H.	M. Mar. 2, 1881.	Feb. 7, 1900.	.....
BERESFORD, FRANK	M. Nov. 3, 1875.	Dec. 12, 1887.	XXXVI, 594	
BISHOP, THOMAS SPARKS	J. Sept. 2, 1885.	Nov. 13, 1898.	XLI, 621	
BLICKENSDERFER, JACOB	M. June 1, 1881.	Feb. 26, 1899.	.....
BLISS, HENRY ISAAC	M. Sept. 5, 1883.	July 10, 1896.	XXXVI, 541	
BLUNDEN, HENRY D.	{ J. Jan. 5, 1876.	{ Jan. 7, 1889.	XXXVI, 542	
BODFISH, SUMNER HOMER	{ M. Feb. 4, 1880.	M. Oct. 1, 1889.	XX, 96	
BOEKER, AUGUSTUS WILLIAM	M. Sept. 3, 1890.	Oct. 24, 1894.	XX, 204	
BOOKER, BERNARD FRANK	{ J. Oct. 7, 1885.	{ July 21, 1894.	XX, 183	
BRADBURY, HENRY ROBERT	{ M. June 3, 1891.	A. July 1, 1881.	.....
BRIDGFORD, JOHN	F. Jan. 14, 1871.	F. May 17, 1870.	.....
BRIGGS, ALBERT DWIGHT	F. May 19, 1870.	M. Oct. 19, 1870.	Feb. 20, 1881.	XV, 132
BRIGGS, ROBERT	M. Sept. 1, 1880.	M. Sept. 1, 1880.	July 24, 1882.	XXXVI, 542
BROUGH, REDMOND JOHN	M. Jan. 9, 1881.	M. April 7, 1874.	July 21, 1883.	XII, 40
BROWN, CHARLES IRWIN	M. April 7, 1874.	{ J. Sept. 6, 1876.	Mar. 23, 1899.	.....
BROWN, JOHN MILTON	{ M. May 7, 1879.	{ M. Sept. 5, 1877.	June 16, 1874.	I, 170
BRUNER, DANIEL P.	{ A. Sept. 6, 1871.	M. July 15, 1872.	Aug. 29, 1901.	.....
BRUSH, CHARLES BENJAMIN	M. Sept. 5, 1877.	M. Sept. 15, 1872.	June 3, 1897.	.....
BUCKHOUT, ISAAC CRAIG	{ H. M. Mar. 28, 1853.	M. April 5, 1876.	Sept. 27, 1874.	I, 171
BURDEN, HENRY	M. April 5, 1876.	J. Nov. 3, 1886.	Jan. 19, 1871.	.....
BURR, JAMES DEWEY	J. Nov. 3, 1886.	{ M. Dec. 8, 1868.	May 5, 1886.	XII, 107
BUTTS, ELIJAH POLHILL	{ F. Mar. 12, 1870.	M. June 17, 1868.	Jan. 11, 1892.	XVIII, 129
CAMP, JONATHAN, Jr.	M. Dec. 31, 1873.	April 16, 1874.	I, 186	
CAMPBELL, ALLAN	M. Feb. 19, 1868.	{ H. M. Mar. 1, 1892.	Mar. 18, 1894.	XX, 179
CARD, JOSEPH P.	A. Sept. 5, 1883.	M. May 2, 1888.	Oct. 22, 1894.	XXI, 68
CARPENTER, CLARENCE ALLAN	M. Mar. 5, 1884.	M. Mar. 5, 1884.	Nov. 9, 1899.	.....
CARREL, FREDERICK JANVRIN	M. Sept. 6, 1876.	M. Sept. 6, 1876.	May 2, 1894.	XXXVII, 559
CARTWRIGHT, HENRY	M. Nov. 1, 1882.	M. Nov. 1, 1882.	June 30, 1881.	VII, 124
CARY, EDGAR SHELDON	F. Mar. 30, 1871.	F. Mar. 30, 1871.	Jan. 5, 1883.	XLVI, 555
CASS, GEORGE WASHINGTON, Jr.	{ M. Dec. 8, 1868.	{ M. Dec. 8, 1868.	May 21, 1888.	XXXVI, 599
CHASE, SAMUEL STEWART	F. Mar. 12, 1870.	F. Mar. 12, 1870.	May 29, 1873.	I, 40
CHESBROUGH, ELLIS SYLVESTER	M. June 17, 1868.	M. June 17, 1868.	Aug. 18, 1886.	XV, 160

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Name.	Date of Election.	Date of Death.	Memoirs.*
CISNEROS, FRANCISCO JAVIER	M. May 15, 1872.	July 7, 1898.	<i>XLI</i> , 622
CLARK, IRA EDGAR	J. Feb. 6, 1878.	May 23, 1882.	VIII, 92
CLARK, JACOB MERRILL	M. Jan. 29, 1868.	Dec. 21, 1894.	XX, 203
CLARKE, HENRY WADSWORTH	M. Mar. 15, 1871.	Feb. 23, 1892.	XVIII, 93
CLARKE, THOMAS CURTIS	{ M. Mar. 18, 1868. F. May 20, 1872. }	June 15, 1901.	.....
CLEEMANN, THOMAS MUTTER	M. Oct. 1, 1879.	Nov. 16, 1893.	XX, 69
CLEMENS, ERNEST VICTOR	M. Mar. 1, 1893.	Sept. 3, 1893.	XX, 161
COBB, ROBERT LINAH	M. Jan. 2, 1890.	June 2, 1895.	<i>XXXVI</i> , 545
COCHRAN, A. P.	F. June 19, 1872.	April 26, 1886.	.....
COLBURN, WARREN	M. Mar. 18, 1868.	Sept. 15, 1879.	VI, 4
COLBURN, ZERAH	M. Jan. 5, 1855.	April 26, 1870.	<i>XXXVI</i> , 546
COLBY, CHARLES LEWIS	F. July 31, 1883.	Feb. 26, 1896.	.....
COLMAN, ISAAC D.	M. Feb. 27, 1869.	April 7, 1875.	I, 331
CONNOR, ADDISON	M. Jan. 5, 1887.	Jan. 4, 1891.	<i>XXXVI</i> , 551
CONRO, ALBERT	F. June 13, 1883.	Jan. 10, 1901.	.....
COOKE, ROBERT LATIMER	M. April 17, 1872.	Aug. 11, 1877.	IV, 66
COPPÉE, HENRY ST. LEGER	M. Oct. 5, 1887.	May 8, 1901.	.....
CORREA, EDWARD ARNOLD	M. Mar. 7, 1900.	June 24, 1900.	<i>XLV</i> , 621
CORYELL, MARTIN	M. Dec. 4, 1867.	Nov. 30, 1886.	XV, 133
COURTWRIGHT, MILTON	F. June 11, 1870.	April 25, 1883.	.....
COXE, ECKLEY BRINTON	M. Feb. 7, 1877.	May 13, 1895.	<i>XXXVI</i> , 552
CRABB, THOMAS	J. Apr. 4, 1899.	Dec. 21, 1901.	.....
CRAVEN, ALFRED WINGATE	M. Nov. 5, 1852.	Mar. 27, 1879.	VI, 24
CRAVEN, HENRY SMITH	M. Dec. 5, 1884.	Dec. 7, 1889.	XVI, 217
CUNNINGHAM, PAUL DAVIS	A. M. Mar. 1, 1899.	July 13, 1901.	.....
CURTIS, WENDELL RHODES	{ J. Mar. 3, 1875. M. June 4, 1884. }	Mar. 7, 1893.	XX, 86
CURTIS, WILLIAM GIDDINGS	M. May 3, 1882.	June 15, 1900.	<i>XLV</i> , 624
CUSHING, OLIVER E.	M. July 10, 1872.	Jan. 17, 1890.	XVI, 166
CUSHING, SAMUEL BARRETT	M. Sept. 2, 1869.	July 17, 1873.	I, 43
CUSHING, SAMUEL BARRETT	M. June 1, 1887.	Dec. 3, 1888.	.....
DAGRON, JAMES GUSTAVUS	M. Oct. 6, 1886.	May 25, 1895.	.....
DAVIDSON, MATTHIAS OLIVER	M. April 6, 1853.	Sept. 1, 1872.	XIX, 56
DAVIS, FRANK PAUL	M. Feb. 1, 1888.	May 3, 1900.	.....
DEARBORN, WILLIAM LEE	M. Jan. 29, 1868.	Mar. 15, 1875.	I, 330
DECOURCY, BOLTON WALLER	M. Nov. 6, 1889.	April 1, 1900.	.....
DEGARAY, FRANCISCO	F. Aug. 31, 1883.	Sept. 2, 1896.	.....
DERBISHIRE, JAMES STEWART	M. April 2, 1884.	Jan. 7, 1887.	XIII, 66
DEXTER, GEORGE M.	M. Dec. 3, 1852.	Nov. 26, 1872.	I, 40
DICKINSON, GEORGE CODWISE	M. Feb. 5, 1890.	Jan. 24, 1892.	XVIII, 71
DICKINSON, POMEROY P.	M. Jan. 17, 1872.	Oct. 4, 1895.	<i>XLIII</i> , 611
DILLON, SIDNEY	F. Mar. 26, 1870.	June 9, 1892.	<i>XXXVI</i> , 603
DIRKS, JUSTUS	H. M. June 2, 1880.	Dec. 26, 1886.	XIII, 45*

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Name.	Date of Election.	Date of Death.	Memoirs.*
DIVEN, ALEXANDER SAMUEL	F. June 16, 1870.	June 11, 1896. <i>XXXVII</i> , 571	
DOANE, THOMAS	M. June 7, 1882.	Oct. 22, 1897. <i>XXXIX</i> , 690	
DORAN, FRANK C.	M. Sept. 5, 1883.	Oct. 15, 1898.	
DORSEY, EDWARD BATES	M. June 4, 1879.	†	
DOWNES, STANCLIFF BAZEN	J. April 7, 1886.	April 21, 1895. XXI, 105	
DRESSER, GEORGE WARREN	M. July 5, 1876.	May 27, 1883. XIX, 110	
DUANE, JAMES	M. Mar. 2, 1892.	Jan. 12, 1899.	
DUANE, JAMES CHATHAM	H. M. Nov. 20, 1886.	Nov. 8, 1897. <i>XXXIX</i> , 686	
DU BARRY, JOSEPH NAPOLEON	M. Jan. 6, 1875.	Dec. 17, 1892. XIX, 108	
DURANT, THOMAS C.	F. Nov. 18, 1870.	Oct. 5, 1885. <i>XXXVI</i> , 602	
EADS, JAMES BUCHANAN	{ M. Dec. 16, 1868. F. Mar. 30, 1870. }	{ Mar. 8, 1887. XIII, 46 Nov. 23, 1895. <i>XXXVI</i> , 554 }	
EATON, HORACE LAFAYETTE	M. Feb. 1, 1893.	May 13, 1900.	
EATRS, NORMAN WILDER	M. June 3, 1885.	Jan. 1, 1880. VI, 18	
EDGE, GEORGE WASHINGTON	M. June 11, 1874.	Oct. 7, 1886. XV, 110	
ELLIOTT, GEORGE HARFORD	M. April 4, 1883.	Jan. 16, 1889. XV, 112	
ELLIS, NATHANIEL WEBSTER	M. Feb. 2, 1881.	Jan. 9, 1883. <i>XXXVII</i> , 557	
ELLIS, THEODORE GRENVILLE	{ M. Feb. 17, 1869. F. Nov. 21, 1872. }	June 1, 1898. <i>XLII</i> , 558	
ELLSWORTH, ALFRED BURNHAM	J. May 1, 1889.	Jan. 10, 1893. XIX, 48	
ELY, GEORGE HERVEY	A. May 31, 1892.	Jan. 24, 1894.	
EMACK, CHARLES S.	M. July 6, 1870.	July 26, 1877. IV, 65	
EMERSON, GEORGE DANA	M. Sept. 18, 1872.	Sept. 26, 1900.	
EMERY, CHARLES EDWARD	M. May 6, 1874.	June 1, 1898. <i>XLII</i> , 558	
EMMET, THOMAS ADDIS	M. Nov. 5, 1852.	Jan. 12, 1880. VI, 2	
EMONTS, WILLIAM ALEXIS GEORGE	J. Sept. 6, 1876.	Nov. 5, 1887. <i>XXXVI</i> , 594	
ENSIGN, ELISHA WILLIAMS	F. May 18, 1870.	Oct. 1, 1877.	
ERICSSON, JOHN	H. M. Oct. 2, 1879.	Mar. 8, 1889.	
EVANS, ANTHONY WALTON WHITE	{ M. Dec. 4, 1867. F. Mar. 15, 1870. }	Nov. 28, 1886. XIII, 30	
EVANS, LOUIS PROVOST	M. Sept. 3, 1884.	Aug. 19, 1896.	
FALCONNET, EUGENE F.	M. June 3, 1874.	Oct. 14, 1887. XV, 135	
FARGO, WILLIAM G.	F. May 6, 1870.	Aug. 4, 1881.	
FARNAM, HENRY	F. Nov. 14, 1872.	Oct. 4, 1883. <i>XXXVI</i> , 605	
FARQUHAR, FRANCIS ULRIC	M. July 10, 1872.	July 3, 1883. XV, 165	
FAVA, FRANCIS RENATUS	M. Nov. 5, 1890.	Mar. 27, 1896.	
FEIND, ANTHONY ERNESTE BERNHARD	M. Jan. 2, 1890.	Aug. 21, 1894. XX, 182	
FELTON, SAMUEL MORSE	F. Mar. 23, 1870.	Jan. 24, 1889. XIX, 92	
FIELD, BURR KELLOGG	M. Oct. 1, 1884.	Jan. 13, 1898. <i>XL</i> , 563	
FINK, ALBERT	{ M. July 20, 1870. F. Sept. 3, 1872. }	April 3, 1897. <i>XLI</i> , 626	

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+ Precise date of death unknown.

Name.	Date of Election.	Date of Death.	Memoirs.*
FISHER, CHARLES HENRY	M. June 7, 1869.	Jan. 18, 1888.	XIX, 66
FLAD, HENRY	M. Feb. 15, 1871.	June 20, 1898.	XLII, 561
FLINT, EDWARD AUSTIN	M. May 18, 1870.	Jan. 23, 1886.	XII, 114
FLYNN, PATRICK JOHN	M. Feb. 4, 1891.	June 1, 1893.	XX, 68
FOGG, CHARLES E.	M. Oct. 16, 1872.	April 26, 1891.	XVII, 230
FORD, ARTHUR LIVERMORE	A. Nov. 6, 1872.	May 30, 1880.	VI, 75
FORSHEY, CALEB GOLDSMITH	M. Aug. 7, 1872.	July 25, 1881.	XXXVII, 560
FOWLER, CHARLES EDWARD	M. May 3, 1876.	Jan. 28, 1883.	XV, 164
FRANCIS, JAMES	M. Jan. 4, 1893.	Dec. 1, 1898.	XLV, 627
FRANCIS, JAMES BICHENO	M. Nov. 5, 1852. F. May 4, 1870. H. M. April 5, 1892.	Sept. 18, 1892.	XIX, 74
FREEMAN, ERNEST GREY	{ A. M. May 3, 1893. M. Oct. 5, 1898.	Mar. 6, 1900.	.....
FRENCH, EDMUND	M. Nov. 26, 1852.	July 7, 1860.	XXXVII, 561
FROST, BENJAMIN DIX	M. Feb. 21, 1872.	July 19, 1880.	XIII, 139
GARDNER, EDWARD	M. Nov. 5, 1852.	†	.....
GARDNER, HENRY A.	M. Dec. 13, 1852.	July 26, 1875.	I, 335
GARFIAS, IGNACIO	M. Oct. 5, 1892.	Jan. 16, 1898.	.....
GIBLIN, ARTHUR LEON	J. Jan. 31, 1893.	July 17, 1894.	XX, 171
GILLESPIE, JOSHUA LATHROP	{ J. Feb. 3, 1875. M. April 2, 1884.	Aug. 22, 1890.	XVI, 224
GILLHAM, ROBERT	M. June 2, 1886.	May 19, 1899.	XLIII, 613
GILLISS, JOHN ROBERTS	{ M. June 2, 1869. F. Mar. 15, 1870.	July 16, 1870.	XXXVI, 555
GILMAN, CHARLES CARROLL	F. May 11, 1871.	July 31, 1899.	.....
GILLMORE, QUINCY ADAMS	M. Dec. 2, 1868.	April 7, 1888.	XX, 60
GOLAY, PHILIP	M. Sept. 5, 1877.	Oct. 31, 1898.	.....
GOODWIN, HOMER STANLEY	M. July 20, 1870.	Oct. 25, 1892.	XIX, 163
GOODWIN, JOHN MARSTON	M. Sept. 4, 1872.	Oct. 21, 1891.	XVII, 267
GORRINGE, HENRY H.	A. April 6, 1881.	July 6, 1885.	XVI, 215
GOTTLIEB, ABRAHAM	M. Sept. 4, 1872.	Feb. 9, 1894.	XX, 76
GRAFF, FREDERIC	M. Mar. 7, 1873.	Mar. 30, 1890.	XVII, 247
GRANT, WILLIAM HARRISON	M. July 2, 1873.	Oct. 12, 1896.	XXXVI, 557
GRAIN, WILLIAM	M. Sept. 15, 1869.	Jan. 10, 1877.	.....
GRASSAU, H.	M. July 6, 1853.	May 16, 1880.	.....
GREENE, BENJAMIN H.	M. May 1, 1878.	Jan. 4, 1890.	XVI, 187
GREENE, GEORGE SEARS	{ M. Nov. 5, 1852. H. M. Oct. 26, 1888.	Jan. 28, 1899.	.....
GREENWOOD, WILLIAM HENRY	M. Mar. 3, 1880.	Aug. 29, 1880.	VII, 89
GRIDLEY, VERNON HILL	J. Feb. 4, 1896.	Sept. 17, 1896.	XXXVI, 555
GRIFFEN, JOHN	M. April 15, 1868.	Jan. 14, 1884.	XII, 38
GZOWSKI, Sir CASIMIR STANISLAUS	M. Dec. 2, 1868.	Aug. 24, 1898.	XLII, 567

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+ Precise date of death unknown.

Name.	Date of Election.	Date of Death.	Memoirs.*
HADDOCK, ARBA READ	A. May 4, 1881.	Feb. 28, 1885.	XIX, 67
HALL, GEORGE THOMAS	{ A. Oct. 2, 1872. M. Sept. 2, 1874. }	June 2, 1881.	VII, 97
HARBAUGH, SPRINGER	F. May 19, 1871.	Dec. 8, 1887.	XV, 46
HARDEE, THOMAS SYDENHAM	M. April 4, 1877.	May 20, 1880.	XII, 66
HARDING, HORACE	M. Nov. 2, 1892.	July 29, 1899.	<i>XLIII</i> , 618
HARRIS, HENRIQUE	M. Dec. 3, 1879.	Oct. 10, 1882.	<i>XXXVII</i> , 562
HARRIS, ROBERT LEWIS	M. May 3, 1876.	Sept. 29, 1896.	.....
HARRISON, STEPHEN A.	F. Jan. 30, 1873.	June 6, 1898.	.....
HARROD, THOMAS	J. Dec. 3, 1891.	Dec. 31, 1896.	.....
HASELL, BENTLEY DOUGLAS	M. July 3, 1878.	May 29, 1900.	.....
HASKELL, CHARLES FREDERIC BEALS	M. Oct. 7, 1891.	May 20, 1895.	XXI, 181
HASLETT, SULLIVAN	M. June 4, 1879.	Jan. 4, 1887.	XIII, 127
HATFIELD, ROBERT G.	M. Dec. 4, 1867.	Feb. 15, 1879.	<i>XXXVI</i> , 558
HAWKSHAW, Sir JOHN	H. M. Nov. 3, 1880.	June 2, 1891.	XVII, 250
HAYWARD, JAMES A.	M. Sept. 5, 1877.	Aug. 13, 1880.	VII, 88
HEGEMAN, ALLEN BOGARDUS	M. Feb. 1, 1888.	Oct. 22, 1892.	XIX, 171
HILDRETH, RUSSELL WADSWORTH	J. Jan. 4, 1888.	Dec. 23, 1895.	<i>XXXVI</i> , 596
HILGARD, JULIUS ERASMUS	M. July 10, 1872.	May 8, 1891.	XVIII, 189
HISLOP, JOHN	M. May 1, 1895.	Feb. 22, 1901.	.....
HJORTSEBERG, MAXIMILIAN	M. July 10, 1872.	May 16, 1880.	VIII, 118
HOE, RICHARD M.	M. Oct. 1, 1873.	June 8, 1886.	XVI, 170
HOLLEY, ALEXANDER LYMAN	M. Oct. 1, 1873.	Jan. 29, 1882.	XVI, 212
HOUSTON, JOHN	M. May 6, 1868.	Aug. 30, 1896.	<i>XXXIX</i> , 694
HOWELL, CHARLES W.	M. Mar. 3, 1875.	April 5, 1882.	VIII, 121
HOWELL, GEORGE WASHINGTON	M. May 2, 1888.	Feb. 15, 1901.	.....
HOWLAND, GEORGE, JR.	F. June 6, 1870.	Feb. 18, 1892.	XX, 154
HUMPHREY, WILLIAM SHELDON	A. M. Sept. 2, 1891.	April 18, 1895.	XXI, 98
HUMPHREYS, ANDREW ATKINSON	H. M. May 7, 1873.	Dec. 27, 1883.	XVI, 219
HUNT, ALFRED EPHRAIM	M. Sept. 1, 1886.	April 26, 1899.	<i>XLVI</i> , 557
HUNT, RANDELL	M. May 2, 1883.	Jan. 24, 1898.	<i>XLV</i> , 629
HUNTINGTON, COLLIS P.	F. Mar. 10, 1877.	Aug. 13, 1900.	.....
HUTTON, WILLIAM RICH	M. Jan. 8, 1873.	Dec. 11, 1901.	.....
HYDE, WILLIAM B.	M. July 12, 1877.	June 8, 1882.	XVI, 172
JAMES, JOHN COLLINSON	M. Mar. 1, 1876.	Feb. 27, 1883.	XVI, 164
JENNINGS, HENRY CLAY	M. April 6, 1887.	Mar. 13, 1894.	XX, 88
JERVIS, JOHN BLOOMFIELD	{ M. Dec. 4, 1867. H. M. Dec. 2, 1868. }	Jan. 12, 1885.	XI, 109
JEWETT, WILLIAM B.	J. June 4, 1891.	Nov. 7, 1894.	XX, 202
JOHNSON, ARCHIBALD	M. April 6, 1898.	Oct. 3, 1899.	.....
JOHNSON, CHARLES ROBERTS	M. June 3, 1885.	Sept. 11, 1893.	XX, 45
JOHNSON, T. MARR	M. Feb. 26, 1872.	July 31, 1874.	I, 171
JOHNSTON, ANDREW LANGSTAFF	M. June 4, 1890.	May 15, 1901.

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Name.	Date of Election.	Date of Death.	Memoirs,*
JORDAN, GABRIEL	M. Sept. 18, 1872.	Nov. 10, 1884.	XVI, 184
JOY, JAMES FREDERIC	F. Nov. 6, 1872.	Sept. 24, 1896. <i>XXXVII</i> , 575	
JUDAH, THEODORE DEHONE	M. May 4, 1853.	Nov. 2, 1863. <i>XXXVIII</i> , 448	
KEEFER, SAMUEL	M. Jan. 6, 1869.	Jan. 7, 1890.	XVI, 220
KILLEBREW, SAMUEL	M. Sept. 2, 1885.	Jan. 9, 1899.	<i>XLI</i> , 639
KINGSLEY, WILLIAM C.	F. June 6, 1870.	Feb. 21, 1885. <i>XXXVI</i> , 612	
KIRKWOOD, JAMES PUGH	M. Nov. 2, 1852.	April 22, 1877.	IV, 60
KLOMAN, ANDREW	F. Jan. 27, 1875.	Dec. 19, 1880.	VII, 122
KNIGHT, WILLIAM BAKER	{ J. Jan. 6, 1875. (M. Jan. 7, 1880.)	Dec. 7, 1890.	XVII, 277
KRUPP, ALFRED	F. June 14, 1870.	July 14, 1887. <i>XXXVI</i> , 609	
LANE, MOSES	M. Dec. 4, 1867.	Jan. 25, 1882.	XIX, 58, 101
LASSIG, MORITZ	M. April 2, 1884.	Jan. 7, 1902.	.....
LATIMER, CHARLES	M. April 5, 1876.	Mar. 25, 1888.	XV, 137
LAURIE, JAMES	M. Nov. 5, 1852.	Mar. 16, 1875. <i>XXXVII</i> , 553	
LAWLER, JOHN	F. April 28, 1883.	Feb. 23, 1891.	<i>XLVI</i> , 560
LAWSON, WILLIAM BATEMAN	M. Feb. 1, 1893.	Jan. 27, 1901.	.....
LAWTON, FREDERICK BEECHER	{ J. Nov. 5, 1891. (A. M. Nov. 4, 1896.)	Oct. 13, 1897.	.....
LEERS, FRANK ADOLPH	M. May 4, 1887.	May 19, 1890.	XX, 85
LESAGE, LOUIS	M. Sept. 7, 1881.	Jan. 9, 1889.	XVI, 96
LEUTZÉ, TREVOR McCURG	M. Feb. 3, 1897.	Oct. 14, 1901.	.....
LEWIS, ISAIAH WILLIAM PENN	M. Jan. 5, 1853.	Oct. 18, 1856. <i>XXXVIII</i> , 453	
LEWIS, JAMES FREDERICK	A. Feb. 6, 1889.	July 23, 1901.	.....
LINDENTHAL, DOMNIK	A. M. Mar. 4, 1896.	June 8, 1900.	<i>XLV</i> , 637
LOCKE, AUGUSTUS WOODBURY	M. June 7, 1882.	May 14, 1893.	XIX, 172
LOCKWOOD, JOHN	A. April 5, 1882.	Dec. 9, 1891.	XVIII, 192
LONG, DENNIS	F. Mar. 28, 1872.	Oct. 8, 1893.	.....
LOTZ, WILLIAM HERMAN	M. Sept. 1, 1875.	Jan. 31, 1894.	XX, 74
LOVECRAFT, FREDERICK AARON	F. Nov. 1, 1892.	Oct. 26, 1893.	.....
LOVETT, THOMAS DAVIS	M. May 3, 1871.	Dec. 5, 1897.	<i>XL</i> , 571
LOWE, GORHAM PARSONS	M. April 21, 1869.	Jan. 8, 1894.	XX, 72
LOWTHORP, FRANCIS C.	F. Mar. 17, 1870.	June 1, 1890.	XX, 196
LUDLOW, WILLIAM	M. July 5, 1882.	Aug. 30, 1901.	.....
LYON, WILLIAM M.	F. Mar. 23, 1870.	July 3, 1889.	XVI, 112
LYTE, FRANCIS ASBURY	A. M. Oct. 5, 1892.	June 24, 1896. <i>XXXVIII</i> , 461	
MCALPINE, CHARLES LEGRAND	M. Dec. 4, 1867.	Jan. 11, 1884. <i>XXXVII</i> , 563	
MCALPINE, WILLIAM JARVIS	{ M. Feb. 3, 1853. (H. M. Oct. 26, 1888.)	Feb. 16, 1890.	XVIII, 115
MACLEOD, JOHN	M. July 10, 1872.	Jan. 21, 1900.
MCNAIR, THOMAS SPEER	M. July 2, 1873.	July 25, 1901.

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MACY, ARTHUR	{ J. July 12, 1877. M. Dec. 2, 1885.	April 14, 1891.	XXXVII, 562
MAHAN, DENNIS HART	H. M. Mar. 2, 1853.	Sept. 16, 1871.	XIX, 161
MALEZIEUX, EMILE	H. M. Nov. 3, 1880.	May 20, 1885.	XXXVI, 524
MANN, GEORGE EDWARD	M. Sept. 3, 1884.	Oct. 2, 1897.	.....
MARSHALL, CHARLES ALFRED	M. Oct. 1, 1884.	May 31, 1889.	XVI, 99
MARSLAND, EDWARD	M. Feb. 6, 1878.	June 25, 1898.	.....
MARTIN, ROBERT KIRKWOOD	M. June 1, 1892.	Nov. 24, 1893.	XX, 43
MASON, EDDY D.	{ M. July 19, 1872. F. Dec. 28, 1872.	Dec. 19, 1874.	I, 329
MERCUR, FREDERICK	M. July 20, 1870.	Jan. 10, 1888.	XVII, 157
MERIWETHER, NILES	M. Nov. 1, 1871.	Dec. 28, 1900.	XLIV, 632
MERRILL, WILLIAM EMERY	M. Oct. 6, 1872.	Dec. 14, 1891.	XVIII, 90
MERZ, FREDERICK W.	F. May 28, 1872.	Dec. 8, 1883.	XXXVI, 615
MICHAELIS, OTHO ERNEST	M. May 6, 1874.	May 1, 1890.	XVII, 132
MICHIE, WILLIAM ROBERTS	{ J. Feb. 28, 1893. A. M. Oct. 7, 1896.	Feb. 2, 1899.	XLII, 647
MILLER, SAMUEL H.	M. Sept. 6, 1882.	Mar. 18, 1891.	XVII, 208
MILLER, SILVANUS, JR.	M. Mar. 2, 1887.	Dec. 17, 1897.	XXXIX, 696
MINTURN, ROWLAND ROBINSON	M. Nov. 2, 1887.	April 7, 1898.	.....
MITCHELL, ALEXANDER	F. June 13, 1883.	April 19, 1887.	XIII, 98
MOFFET, JAMES DAVID	{ A. M. Nov. 4, 1891. M. Feb. 7, 1894.	Nov. 3, 1899.	.....
MONROE, JOHN ALBERT	M. Sept. 4, 1869.	June 11, 1891.	XIX, 148
MORLEY, JAMES HENRY	M. Oct. 6, 1886.	Sept. 8, 1889.	XVI, 110
MORLEY, WILLIAM RAYMOND	M. Sept. 6, 1882.	Jan. 3, 1883.	IX, 121
MORRELL, WILLIAM H.	M. Nov. 5, 1852.	†	.....
MORRIS, GOVERNEUR	M. Oct. 3, 1888.	Dec. 30, 1897.	XXXIX, 698
MORRIS, ROBERT CAMPBELL	M. Jan. 7, 1874.	Nov. 8, 1892.	XVIII, 220
MORRIS, WILLIAM W.	M. Jan. 5, 1853.	†	.....
MORSE, JAMES OTIS	M. Feb. 9, 1853.	Mar. 8, 1883.	XIX, 47
MORTON, JOHN HENRY	M. June 3, 1891.	Feb. 8, 1892.	XVIII, 105
MURDOCH, GILBERT	M. Sept. 7, 1881.	May 28, 1894.	XX, 152
NEILSON, ROBERT	M. Feb. 17, 1869.	Oct. 12, 1896.	XXXVII, 564
NEWELL, JOHN	M. Jan. 29, 1868.	Aug. 26, 1894.	XX, 172
NEWHAM, CHARLES EDWARD	M. Dec. 7, 1887.	Feb. 1, 1898.	.....
NEWTON, ISAAC	M. Mar. 3, 1880.	Sept. 25, 1884.	XI, 128
NEWTON, JOHN	H. M. April 30, 1894.	May 1, 1895.	.....
NICHOLS, NORMAN JAMES	M. Dec. 5, 1888.	April 8, 1896.	XXXVI, 559
NICKERSON, LOUIS H.	M. Sept. 18, 1872.	May 6, 1877.	.....
NORMAN, GEORGE H.	{ M. Feb. 17, 1869. F. Mar. 23, 1870.	Feb. 4, 1900.
NORTON, FREDERICK OAKFORD	F. June 4, 1879.	Sept. 27, 1892.	XVIII, 219

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† Precise date of death unknown.

Name.	Date of Election.	Date of Death.	Memoirs.*
NOURSE, EDWIN GREEN	M. Sept. 3, 1884.	Dec. 8, 1897.	<i>XXXIX</i> , 699
NOYES, ALBERT FRANKLIN	M. Dec. 3, 1884.	Oct. 12, 1896.	<i>XXXVI</i> , 560
OGDEN, WILLIAM B.	F. Mar. 23, 1870.	Aug. 3, 1877.	IV, 67
O'MELVENY, JOHN CHARLES	M. May 4, 1898.	Oct. 3, 1899.
O'SULLIVAN, THOMAS S.	M. Jan. 5, 1853.	Nov. 1, 1855.
PADDOCK, JOSEPH HILL	M. Oct. 5, 1892.	April 4, 1894.	XX, 89
PAINE, WILLIAM H.	M. May 12, 1875.	Dec. 31, 1890.	XVII, 160
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PETRY, ALFRED	M. Oct. 6, 1886.	May 14, 1901.
PHILBRICK, EDWARD SOUTHWICK	M. May 6, 1874.	Feb. 13, 1889.	<i>XXXVIII</i> , 454
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PHINNEY, HENRY WARD BEECHER	M. Jan. 7, 1885.	Nov. 22, 1888.	<i>XXXVI</i> , 563
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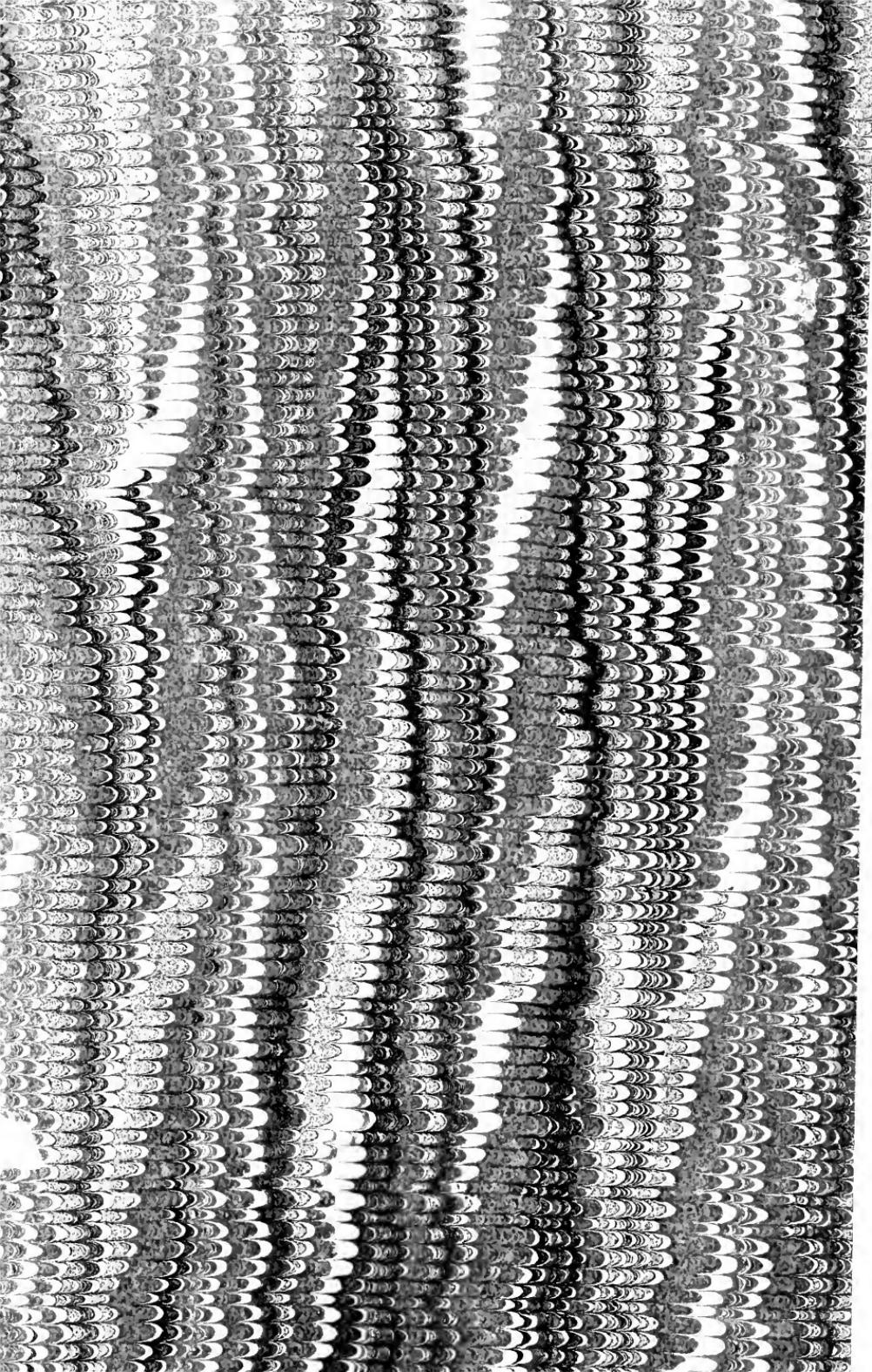
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